

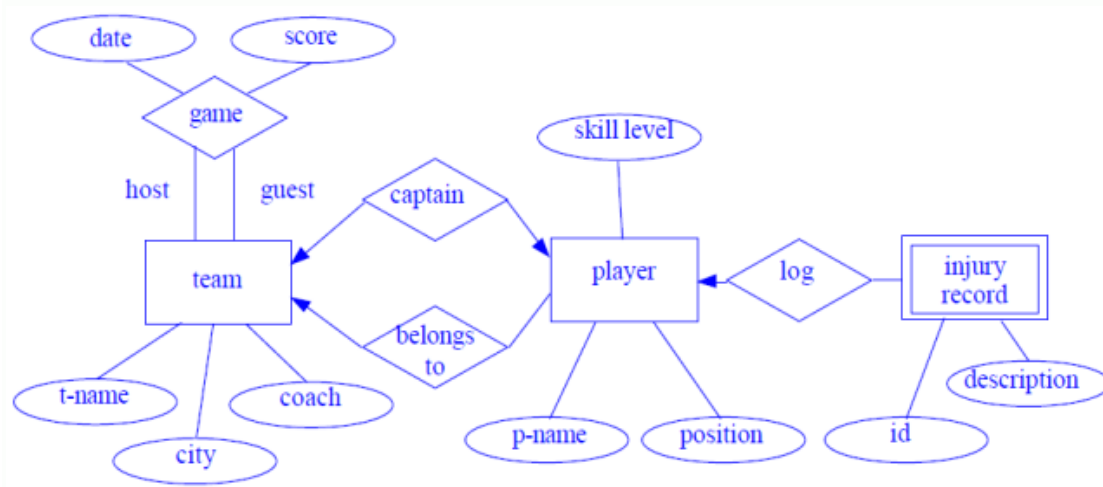
E-R Model Case Studies

1 : Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):

- the NHL has many teams,
- each team has a name, a city, a coach, a captain, and a set of players,
- each player belongs to only one team,
- each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records,
- a team captain is also a player,
- a game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

Construct a clean and concise ER diagram for the NHL database.

Answer :

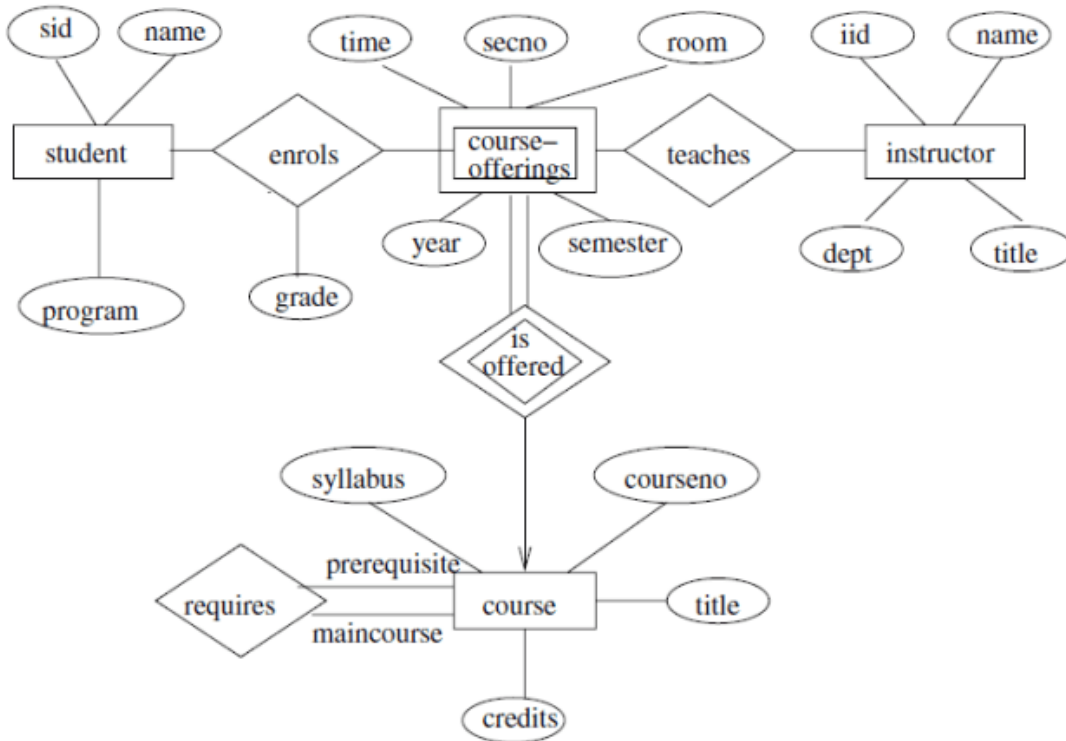


2: A university registrar's office maintains data about the following entities:

1. courses, including number, title, credits, syllabus, and prerequisites;
2. course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom;
3. students, including student-id, name, and program;
4. instructors, including identification number, name, department, and title.

Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.

Answer :

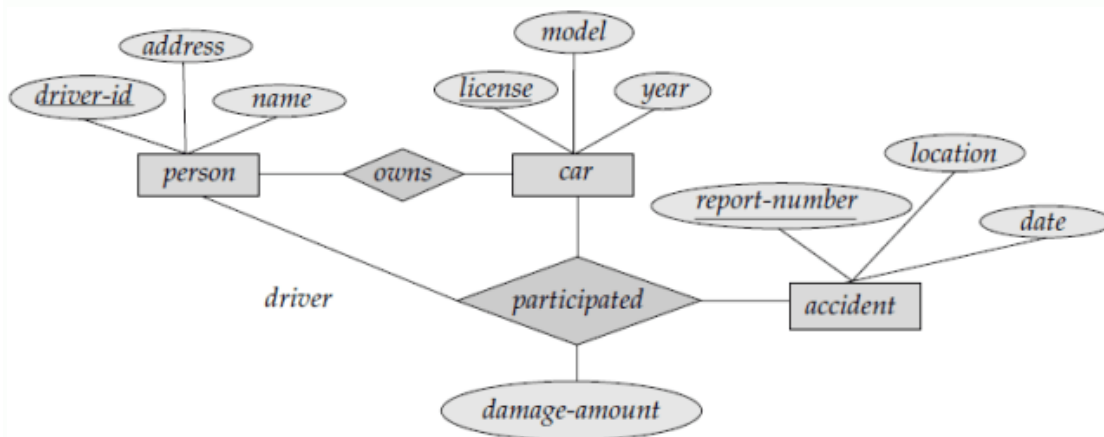


E-R diagram for a university.

3:

(a) Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.

Answer :



E-R diagram for a Car-insurance company.

(b) Construct appropriate tables for the above ER Diagram ?

Car insurance tables:

person (driver-id, name, address)

car (license, year,model)

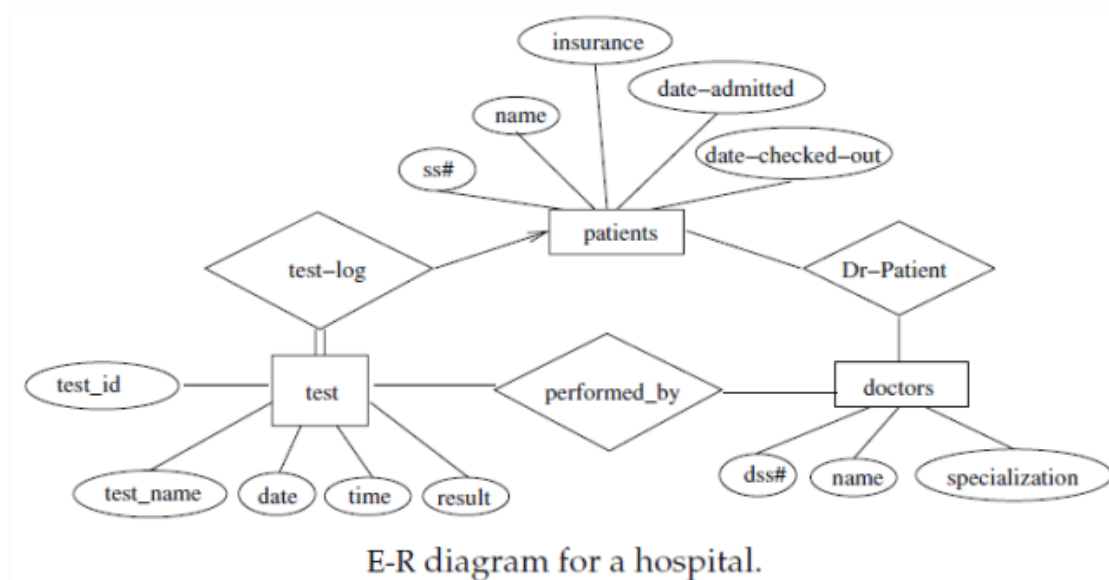
accident (report-number, date, location)

participated(driver-id, license, report-number, damage-amount)

4:

(a) Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.

Answer :



E-R diagram for a hospital.

(b) Construct appropriate tables for the above ER Diagram :

Patient(SS#, name, insurance)

Physician (name, specialization)

Test-log(SS#, test-name, date, time)

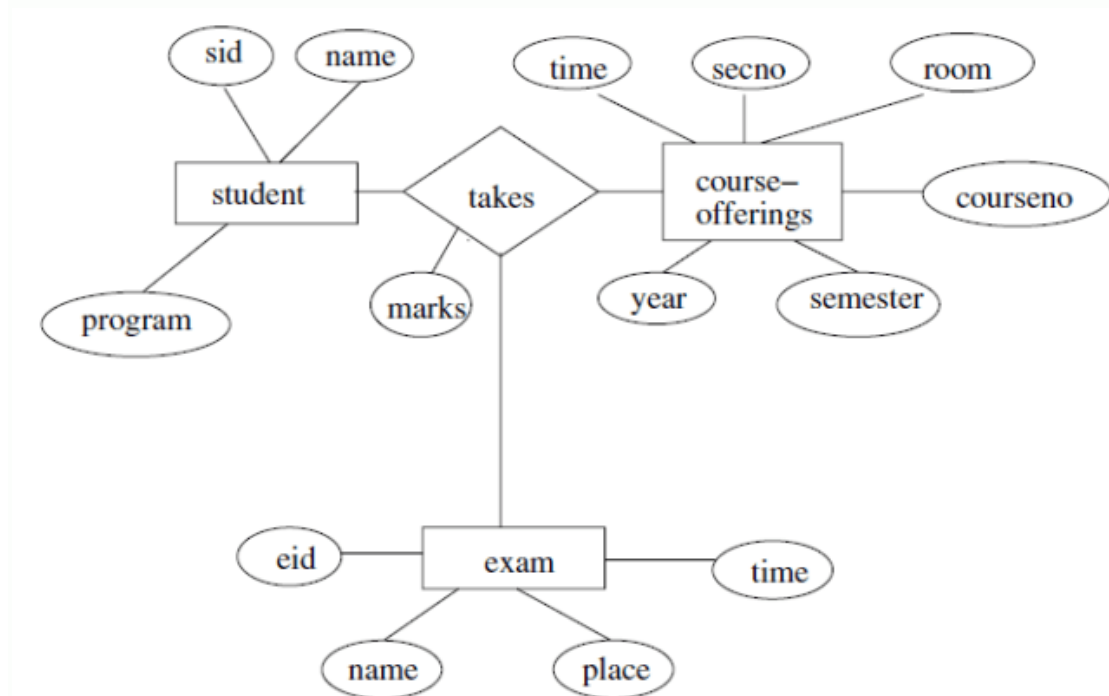
Doctor-patient (physician-name, SS#)

Patient-history(SS#, test-name, date)

5: Consider a database used to record the marks that students get in different exams of different course offerings.

a) Construct an E-R diagram that models exams as entities, and uses a ternary relationship, for the above database.

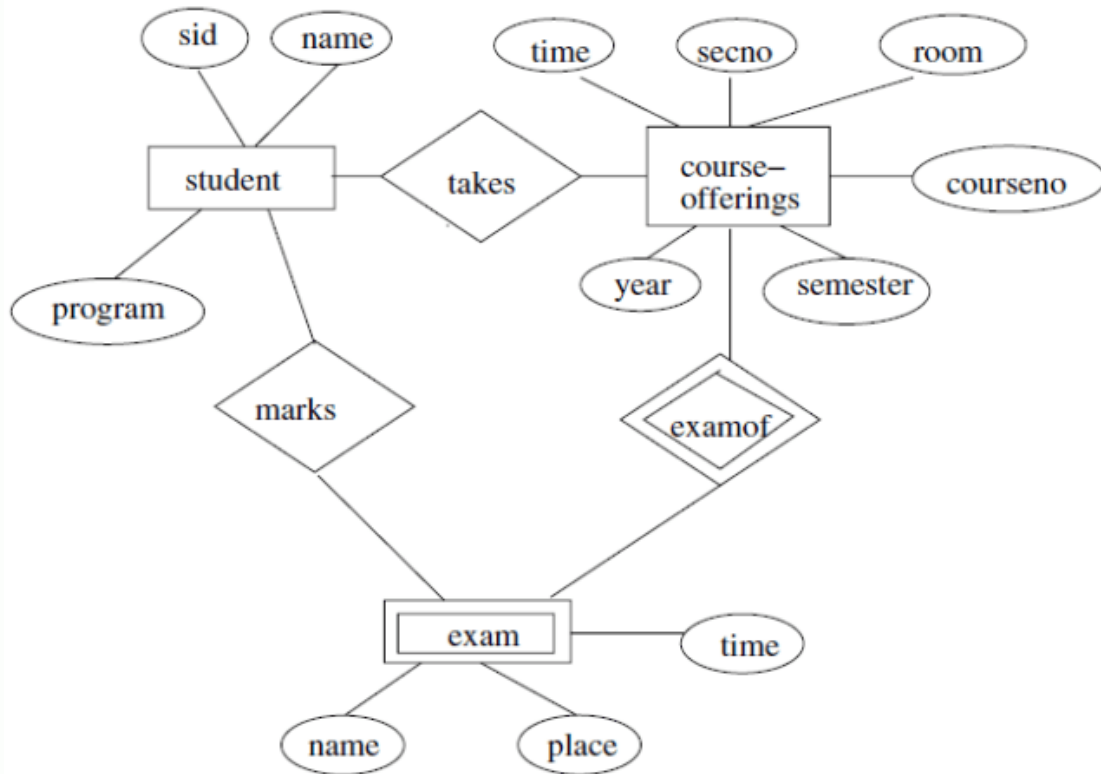
Answer a :



E-R diagram for marks database.

b) Construct an alternative E-R diagram that uses only a binary relationship between students and course-offerings. Make sure that only one relationship exists between a particular student and course-offering pair, yet you can represent the marks that a student gets in different exams of a course offering.

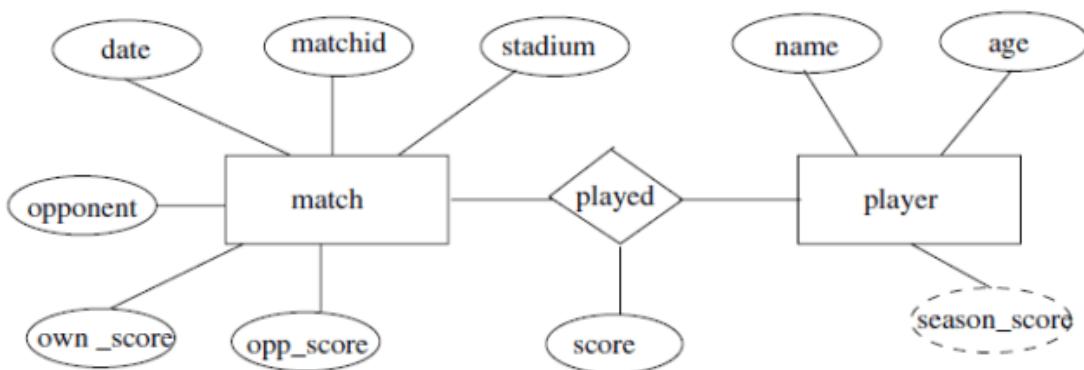
Answer b:



Another E-R diagram for marks database.

6: Design an E-R diagram for keeping track of the exploits of your favorite sports team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics should be modeled as derived attributes.

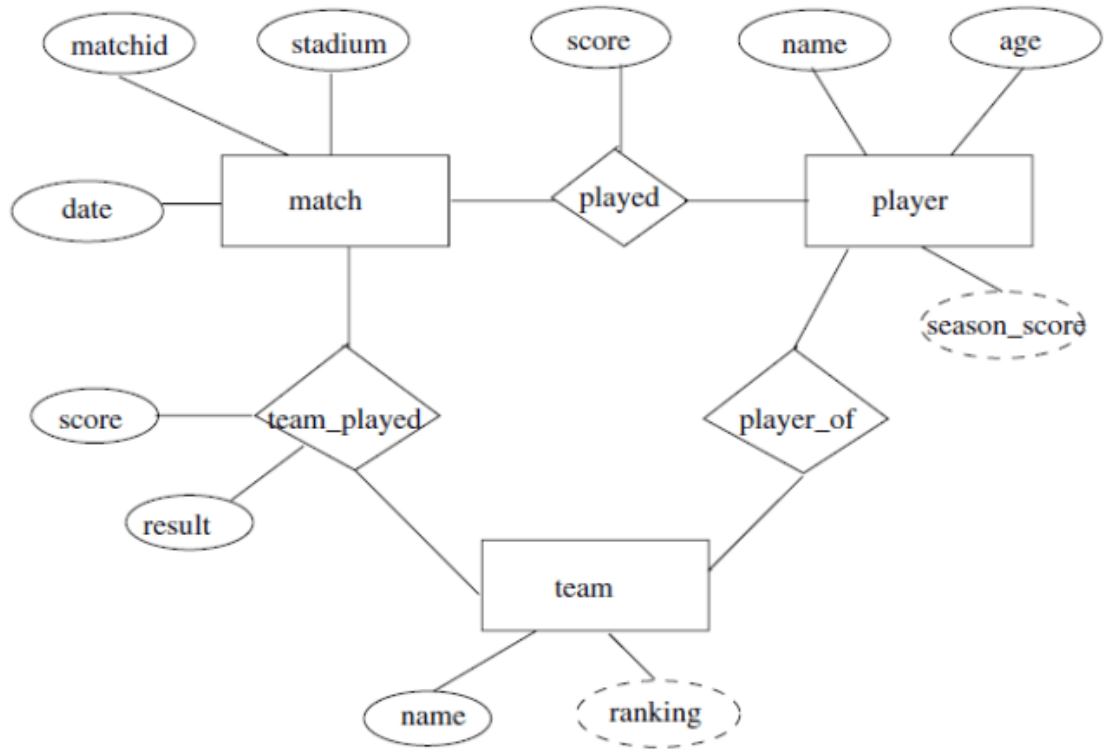
Answer :



E-R diagram for favourite team statistics.

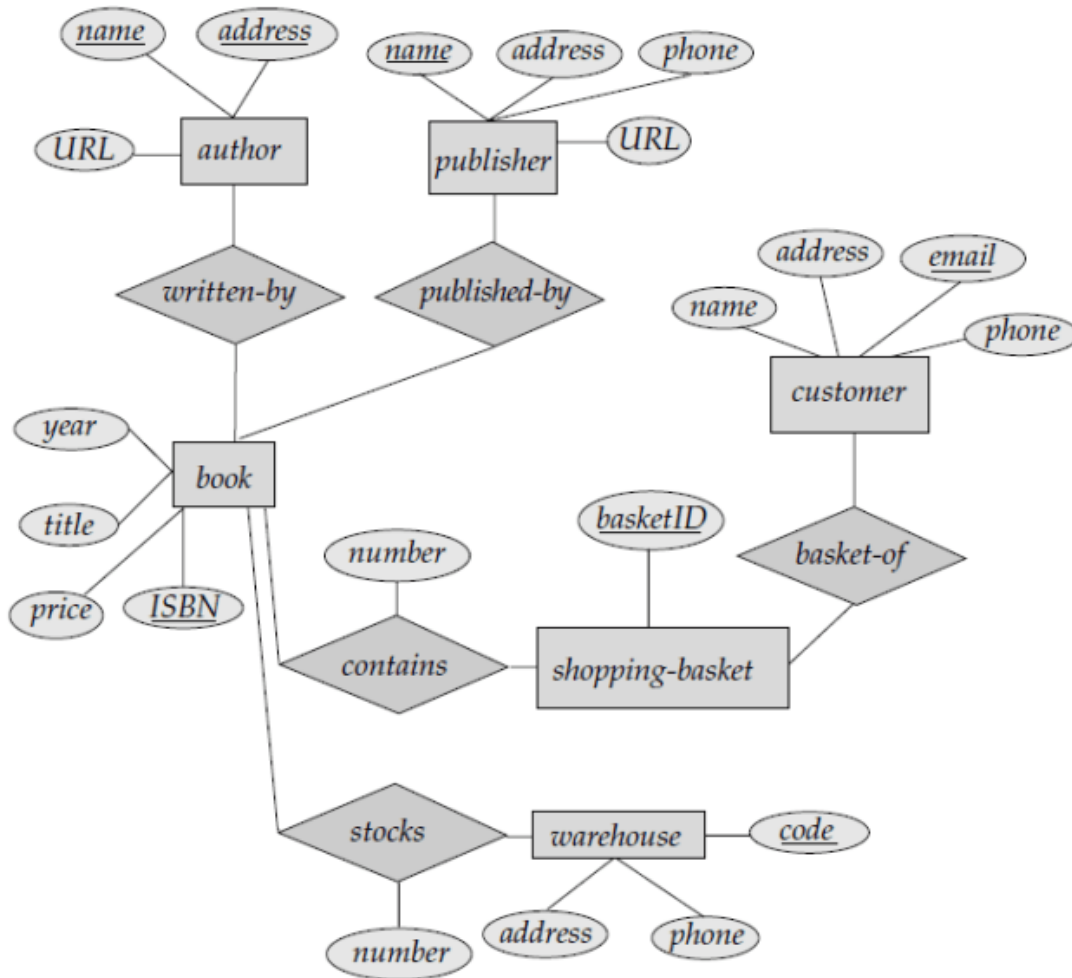
7 :Extend the E-R diagram of the previous question to track the same information for all teams in a league.

Answer :



E-R diagram for all teams statistics.

8 : Draw the E-R diagram which models an online bookstore.
 Answer :



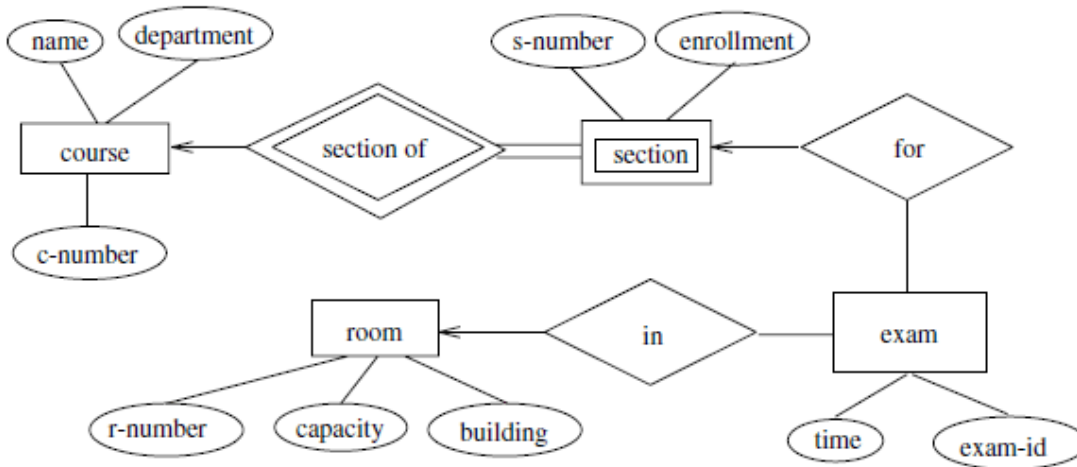
ER Diagram for Online BookStore

9 : Consider a university database for the scheduling of classrooms for -final exams. This database could be modeled as the single entity set exam, with attributes course-name, section-number, room-number, and time. Alternatively, one or more additional entity sets could be defined, along with relationship sets to replace some of the attributes of the exam entity set, as

- course with attributes name, department, and c-number
- section with attributes s-number and enrollment, and dependent as a weak entity set on course
- room with attributes r-number, capacity, and building

Show an E-R diagram illustrating the use of all three additional entity sets listed.

Answer :

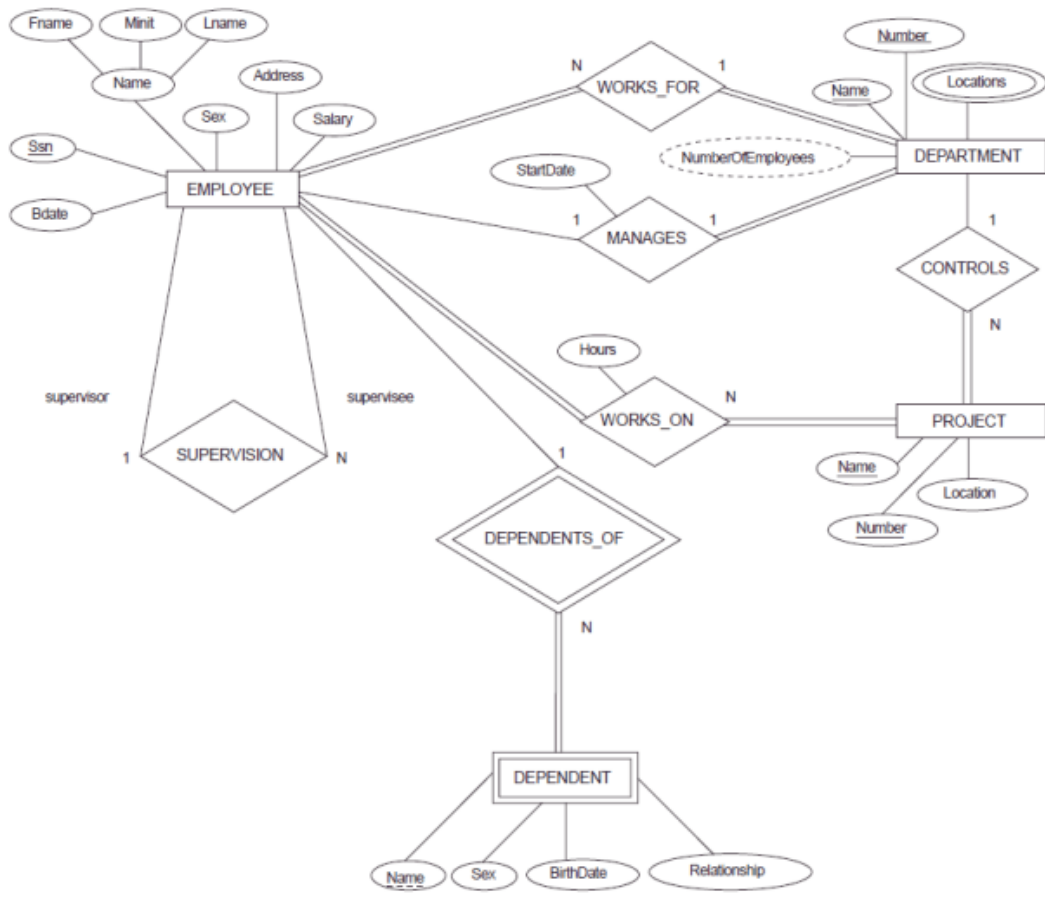


E-R diagram for exam scheduling.

10 : Construct an ER Diagram for Company having following details :

- Company organized into DEPARTMENT. Each department has unique name and a particular employee who manages the department. Start date for the manager is recorded. Department may have several locations.
- A department controls a number of PROJECT. Projects have a unique name, number and a single location.
- Company's EMPLOYEE name, ssno, address, salary, sex and birth date are recorded. An employee is assigned to one department, but may work for several projects (not necessarily controlled by her dept). Number of hours/week an employee works on each project is recorded; The immediate supervisor for the employee.
- Employee's DEPENDENT are tracked for health insurance purposes (dependent name, birthdate, relationship to employee).

Answer :



Application of Business Intelligence in Retail Industry

ZARA is a Spanish clothing and accessories retailer based in Arteixo, Galicia. Founded in 24 May, 1975 by Amancio Ortega and Rosalía Mera, the brand is renowned for its ability to deliver new clothes to stores quickly and in small batches. Zara needs just two weeks to develop a new product and get it to stores, compared to the six-month industry average, and launches around 10,000 new designs each year. Zara was described by Louis Vuitton Fashion Director Daniel Piette as “possibly the most innovative and devastating retailer in the world. The company produces about 450 million items a year for its 1,770 stores in 86 countries.

The Zara has made use of [Information Systems \(IS\)](#) and to advance in many areas. This has resulted in huge success for the company. This included application of [Business intelligence \(BI\)](#) involves technologies, practices for collection, integration and applications to analyze and present business information. The main aim of business intelligence is to promote better business decision making.

BI describes a group of information on concepts and methods to better decision making in business. This is achieved by employing a fact based support systems. The intelligence systems are data-driven and sometimes used in executive information systems. Predictive views on business operations can be provided by use of BI systems. predictive views on business operations can be provided by use of BI systems since historical and current data has been gathered into a data bank performance management benchmarking is done whereby information on other companies in the same industry is gathered.

Since the Zara's have large network and therefore dealing with large volumes of data, an enterprise information system has been employed in the firm. This is generally a type of computing systems that involves an enterprise class that is, typically offering total quality service handling large volumes of data and able to sustain a big organization. With this system, a technology platform is provided which enables the enterprise is provided to that information can be shared in all useful levels of management enterprise systems are important in removing the problem of fragmentation of information. This happens when there are numerous

information systems in an enterprise. The problem is solved by developing a standard data structure.

The Zara being big organization, the enterprise systems is housed in many different data centers, and includes content management system as the main application. The Zara team comprises technology professionals. These include content specialists, network and system engineers, flash developers, database business analysts and administrators, software developers, quality assurance managers and computer and applications support technicians. All these specialists work in tandem to bring about competitive advantage to business by allowing for quick-response capability.

The Zara is devoted to integrating information technology appropriately into all areas of its operations and activities. The range of services and resources available to its clients is attributed to the commitment of integration of IT properly in the organization. The client services group in the Zara partners with staff and clients to identify and meet each group's technological requirements. This group of technical advisors associates with departments to execute a roadmap for a team's technological vision and then defines this vision within entity projects.

Much support is required for invariable innovation. The Zara IT group is devoted to developing community through technology and operates closely with business associates. The IT group is devoted to developing community through technology and operates closely with business associates. The IT group has technical support and tools they require to come up with new ideas and spread the ideas to the wider community worldwide. This ensures that client needs are realized. A constantly growing state-of-the-art technology infrastructure has enabled the firm to develop and maintain a fully integrated organization/ enterprise. The infrastructure has enabled the firm to develop and maintain a fully integrated organization/ enterprise. The infrastructure entails a core of systems and attempts designed to produce the flexibility and capacity for innovation and growth.

The Zara thrives in an environment of change, experimentation and learning that is spreading over the boundaries for the application of IT in their business in the enterprises an easy-to-use

modular tools, templates and platforms that involve all sides of life at the Zara firms including [career development](#) , administration and operations are implemented and developed.

In the Zara other web-based solutions are deployed with an advance [knowledge management](#) thereby making a big shift in the quality and speed of work in how the enterprises function. In the exploding growth of the software market a new world growth for the software market a new world of connectivity is realized in the Zara. The urgency of the business recognizing the importance of corporate portal has enabled linkage of information, data, people and knowledge to provide business solutions. The corporate portals come from consumer portals like Alta-vista, yahoo! and Lycos.

The portals (gateways) show the importance of letting clients have a wide scope of varied information on the web. This has given rise to the increase in multitasking, receiving information and checking from varied sources and thereby getting involved in projects that cross geographical boundaries with this technology the needs of the community, employees and even the extended network that is more advanced are served.

The Zara is possibly the most devastating and innovative retailer in the world. With more than 1000 shops world wide, the Zara has turned controlled over garment factories into a [competitive advantage](#) by making and designing the garments. By making the garments itself, it can quickly react to varying market trends. The Zara has been able to succeed in [building a massive brand](#), without promotion or advertising but through the information systems and information technology.

M.Com. - Part II

Semester IV

Subject -: CASE STUDY

Objective of the paper -

- 1) To study the application of theory of marketing management in practice.
- 2) To Develop the Problem solving capabilities.
- 3) To enhance the analytical ability.

Meaning of the Case Study -

'A chunk of reality brought to the classroom for further Analysis'

This paper will be divided in to two parts. Part -I for confirming theoretical background about case study it consists of -

- a) Meaning and definition of case study.
- b) Purpose of case study.
- c) Types of cases.
- d) Benefits and limitations of case study.
- e) Steps in solving case study
- f) Various approaches to case study
- g) Case study as a tool of marketing research.

Part - II will be based on practical cases on the topics related to issues based on marketing areas.

Part - I carry 25 marks and Part - II 75 marks.

In the examination some practical and contemporary cases and case lets based on marketing will be asked. Some cases based on applied area in marketing and other on theoretical bases. Following are some of the sample cases and case lets for reference.

Case No. - 1

CONSUMER RESEARCH ON HORLICKS

It's a brand that's been growing steadily over the years. And increasing the audience that it addresses as well. The new ad campaign of the Rs. 600 crore Horlicks brand is just hitting national networks and the message is clear, 'many things to many people. Although Horlicks features in the top 10 of most consumer surveys this is one of its highest ratings so far. Says Simons J. Scarf, managing director, Smith Kline Beecham Consumer Healthcare (SBCH), "We are delighted at the rating that Horlicks has got in the ET survey. We're obviously aware of the power of Horlicks through our closeness to consumers, but it is always nice to get independent acknowledgement of the fact."

The flagship of SBCH, Horlicks has been showing consistent annual value growth of about 25 per cent in the last three years. And more is expected.

Which is why SBCH is busy setting up a Rs. 250 crore dedicated Horlicks facility at Sonapat, Haryana.

Invented in 1873 by James Horlicks, the brand has been available in India for 70 years. From being a drink taken only during convalescence the brand has repositioned itself since the seventies as a 'great family nourished'. Explains Scarf, "We have nurtured the equity of Horlicks carefully over the years and this has resulted in a unique relationship between the brand and millions of consumers across India".

In fact, the company's consumer research shows that consumers over time and experience have developed an emotional bonding with the brand. That's something they find more powerful than a rational bonding. Vibrancy has been maintained despite its mature age by avoiding complacency. Most big brands with huge equities tend to fall to the temptation of sitting tight. And that in turn can result in a brand losing relevance.

But Horlieks has taken a proactive stance. Explains R. Shyam Sundar, head of marketing — nutritional business, SBCH, "Our learning has been that if there is a big brand with a lot of equity and it does nothing new, someone else usually comes in and segments the market. If instead, the market leader is the one to segment, he can gain the most". So before anyone else could, the company stake out some new turf. Which is why Horlicks has come out with new products such as Junior Horlicks, Mother's Horlicks and Horlicks Biscuits? The idea here is to extend the core values to new formats and benefits.

And that in turn grows the market. Take biscuits. They've meant a different distribution and marketing technique — allowing access to the brand at a low price. And that gives the brand a means to get into smaller outlets — including the corner pan-bidi shop where it never could have been before. Even if products like Junior Horlicks cannibalize the mother brand, at least 80 percent of its users are new incremental consumers.

CASE QUESTIONS

1. Discuss the role of brand research in marketing.
2. Discuss the objectives of brand research.

CASE No - 2 RAMA STORE

In 2005, Rama Store not only had a great year, it also swept the top places at Punjabi Bagh, winning each of the first ten places except ninth. Comfortable in the fact that the company had an attractive product, the president of Rama Store decided to go directly to the customer. The idea, instead of concentrating company efforts and resources on improving the relations with the dealers, was to emphasis improving relations with the ultimate consumer. To implement this tactic, the plan was to eliminate the dealer completely and replace him or her with agents.

To say the plan did not work well is an understatement. Rama Store distributors, who had represented it in India, initiated legal action against the Store in four states. All 323 Rama Store — Audio dealers felt betrayed by the elimination of their franchises. Although they were offered the opportunity to become agents, they were so opposed that they sued Rama Store. The law suits by these dealers sought damages exceeding 50 core. Rama Store top management decided that perhaps their original distribution system wasn't so bad after all.

QUESTIONS

1. Identify and discuss the channel alternatives that were available to Rama Store.
2. Do you think that Rama Store failed to properly evaluate the existing distributors? Give your reasons.
3. Design a research methodology for conducting research for Rama Store.

CASE No. - 3
ESTABLISHING A NEW HOTEL

A three star hotel located in Delhi has been experiencing a decline in its occupancy during the past one-year. The management has recently reviewed the problem and is seriously considering to attract business executives as also to provide adequate facilities for holding business conferences, workshops etc.

Since this would involve some renovation of the existing building in addition to new furniture and equipment, the management wants to be cautious in undertaking such expenditure.

Since its inception several years ago, the hotel has been maintaining a complete record of its guests. When a person visits the hotel for the first time, details such as his name, age, sex, permanent address, purpose of visit and duration of stay along with dates are entered on a card.

The guest file has expanded tremendously containing over 8,000 cards. The management wants to make use of this readily available information along with any additional information necessary in this regard.

QUESTIONS

1. Specify the statistical universe implicit in the management's choice of the sample.
2. If a sample is to be drawn from the guest file, describe the procedure you would adopt in each of the following sample designs.
 - (a) Simple random sampling.
 - (b) Systematic random sampling.
 - (c) Stratified random sampling.
 - (d) Cluster sampling.
3. Which one of the sample designs would you select and why?
4. Specify the nature of data that you would collect from the sample respondents?

CASE No - 4
APPLE INDIA LIMITED

M/s Apple India Limited was launching its Apple juice with extraordinary caution. It first undertook a year-and-a-half long test marketing run in Bangalore and then followed it up by a test market launch in May 2006. Meanwhile making up for lost time, the company in just six months, launched its Apple Juice Hyderabad.

The ready-to-use juice is made from fresh apples. The light brown colour and flavour are 'natural', as the product does not contain artificial colour or preservatives. Priced at Rs. 10 for a 200 gm tetra pack, it is currently available in Andhra Pradesh.

The product has a shelf life of one year, but once opened, this has to be stored under refrigeration and used within six days. 'The concept of juice is the same as for both, lemon and mango juice" says Priya Kumar, Product Manager.

Though lemon is used in fairly large quantities in the Southern parts of India, housewives in other parts of India, under pressure of time, have also stated substituting it for soft drinks. The company's pre-launch research also revealed that the respondents (working women and housewives) were positive in product attributes like ease of use, storage and time saving.

QUESTIONS

It you had undertaken the pre-launch survey for Apple Juice in A.P.:

- (i) What would have been your research design?
- (ii) What methods of data collection would have been used by you?
- (iii) What would have been the questionnaire used by you for the survey?

CASE No. - 5
CUSTOMER RESEARCH ON MAGNETIC DISC DRIVES

Rotomatic Electronics was a small company with product line in accessories or medium to large computers. The company specialized in manufacture and sale of magnetic disc drives. The product being a complex one required extensive electric controls. As the product required high quality control it has high unit cost and was manufactured to meet customer satisfaction.

Rotomatic's business in computer industry was highly competitive. Many larger companies manufactured their own magnetic disc drives and also there were quite a large number of small manufacturers who had entered in the field recently. Rotomatics disc drives offered large capacity and high speed and could interface with any existing compute/s. The company could expand its operations due to attractive features and flexibility.

However, as the company was not occupying leadership position in the market, the company had to constantly come up with innovations to increase sales. In order to attain more corporate ability the management decided to diversify into new product areas. They asked the R&D department to design the single board efficient computer. As a result of six months hard efforts the R&D department created the prototype.

QUESTION

1. You are requested to suggest the alternatives to reach the customers. Also suggest the ways and means of positioning the new product in a highly competitive market.

CASE No. - 6
"DYE - GEN" COMPANY

"Dye-Gen" is a medium size, fast growing company. It manufactures mainly the black shade. Their sales manager was impressed by sudden rise in sale of black hair dye in a rural sales area. For last ten years, the demand for black hair dye had been steady and evenly spread over the year. Sales record showed a spurt in the demand in the last year, in one quarter of the year, in that area. Same thing is happening this year also. Market intelligence has come out with surprising facts:

- (a) This rural area is particularly well known for the buffalo breeding and trading.
- (b) Sudden rise in the demand for black hair dye in a particular quarter of the year, coincides with the cattle trading season.
- (c) Buffalo breeders liberally apply the dye on the buffalo's skin, which then shines, looks black and attractive to the prospective buyers.

The Sales manager is happy because the overall sales figures are going up. But the marketing manager is worried, about the 'human' market reaction, if the so far little known 'animal' application becomes public-knowledge.

Questions:

What is your advice to

- a) The sales manager and
- b) The marketing manager.

CASE No. - 7

A SCHEME FOR MARKET SEGMENTATION

As a Marketing Manager of Shoes manufacturing company that has recently entered into technology tie-up with a famous U.S. based company, you faced with a dilemma. Whether to produce a 'robust-cheap-sensible' sports shoe or to produce that variety, which is 'trendy-aesthetic-though expensive'. Your company's Managing Director, himself a M.B.A. (with Marketing elective) has asked you to prepare a scheme for market segmentation before settling for a product design. Here is a chance to prove your marketing talent. Submit your detailed write-up.

CASE No. - 8

SUPER LUGGAGE LIMITED

'Super Luggage Ltd.', a famous bags and baggages manufacturing company, is facing a serious set-back in the market. Reason for this is seen to be a very strong, dealer-promotion scheme, employed by 'Hawana Luggage Ltd.' a rival company. This company is even offering a week-long trip to Singapore for two, to the dealers, if they sell 30,000 pieces in a year.

M/s. 'Super Luggage Ltd.' has always stressed on giving discount to actual consumer, besides offering them the superior product and service. Now they do not know how to handle the aggressive promotion of their rival firm?

The company appoints you to offer sound marketing advice with special references to the promotion policy.

CASE No. - 9

THE PACKING CASE

A certain electrode manufacturing company used to buy approximately 400,000 pcs. Packing cases in a year and the specification provided for $\frac{5''}{8}$ thickness of the plank. During the annual contract suggestions were invited from the supplier with a view to economizing invited from the supplier with a view to economizing on the cost.

One supplier came with the suggestion that by reducing the thickness from $\frac{5''}{8}$ which was a non-standard size to $\frac{1''}{2}$, the saving per case would be approximately 50 p. This was implemented with the help of the technical personnel concerned and resulted in a saving of nearly two to three lakhs of rupees per year on single item.

Some Issues:

1. What could be the cause of thinking of a change in packing cases?
2. How long might this indirect unknown loss have been carried on?
3. Does it affect the
 - (a) Profitability of the company
 - (b) Price at which they can market the product
 - (c) Marketing volume and hence volume of turnover
 - (d) Again, overall profitability to a higher volume ?
4. What is the possibility that this process would be extended to other packing as well as other raw material items ?
5. What should be done to ensure that no such unknown loss happened in future ?
6. How to curtail the loss to a minimum while effective action, took place ?

CASE No. - 10

LIGHTENING COURIER SERVICES MARKET PLAN

'Lightening Courier Services' is the name of proposed venture, of a fleet owner Mr. Speedy. He is a prosperous transport businessman of 15 years standing. However, Mr. Speedy has very knowledge about courier service marketing. He seeks your advice on the preparation of a plan which should be effective on national level. The present fleet of 1000 trucks will be the strength on which he wants to capitalize.

Prepare a write-up suggesting to him an appropriate market plan keeping the fundamentals of services marketing in view.

CASE No. - 11

AN URBAN CONSUMER CO-OPERATIVE STORE MARKETING MANAGER

An Urban Consumer Cooperative Store is functioning for last five years in 'Kirana' goods. The membership is now about 60,000 strong. The store operates through its four branches situated at prominent locations. The store has now decided to enter into the field of marketing the notebooks for school and college students. Notebook manufacturers are willing to supply as many notebooks as the store may demand.

Write a note on the capacity and context of marketing manager about marketing strategies that the 'Cooperative Store' should adopt.

Case Studies Paper VIII (404)
Sem.IV
M.Com.Part II
Patter 2008 Wef from June 2009

Case Studies :

There will be a paper of case studies for external students. The paper will be set for 80 marks to be converted to 100 marks. In the question paper 04 cases are given. It will be covered, each carrying 20 marks.

Note : The paper of case studies will be offered only by external students only..

CASE No.1 :

‘X’ Limited of India, is the leading company, in manufacturing and distributing computers through out the country. The company obtained the ‘Internet Vendor’s website’ in United States of America. The server is located in United States of America. The website is mainly used for identifying the customers and selling computers through the globe. A buyer from any part of the world can go through the details of computers on the website, and decide which type of computers should be bought.

After having decided, the buyer can place an order for computer by visiting the website and by providing the information requested to enter the transaction. At the same time the buyer’s authorization and credit card number is routed on the digital highway to the bank. After closing the deal the digital information will generate physical distribution order to transport the computer to the address of the buyer. The buyer acknowledges the physical delivery of the computers.

Your are required to discuss the issue as to

- a) the fixed place of business.
- b) does the server constitute a place of business ?
- c) what would happen if the vendor’s server is in the state of the

buyer ?

CASE 2

In an E-trade agreement, signature is based exclusively on asymmetric methods or techniques. It has been described as a special door, which can be opened with a four key lock. The two keys are on every side of the door, and each of these two keys belong to a single party. Both the parties stand respectively on each side of the door and both of them have different keys. One of them is coincidental with the key possessed by the other party, since they have agreed on the shape and notches in the key (public key). However, the other party is not, and none of the parties knows exactly, what kind of notches the other key will have. The only thing is sure that the door can only be opened when the four keys are in it. Once both the parties have locked the keys into the door it is possible to open it and for the parties to be sure that they can negotiate through that open door safely without being afraid that an outsider might interfere in their business.

Discuss with reference to authentication of electronic records using digital signatures.

CASE No.3.

Mr.C.H.CHOTE installed a website “chahooindia.com”. This is resembling the another renowned website – “chahoo.com”. The services rendered by Mr.C.H.CHOTE are similar to the services rendered by the “chahoo.com”.
(plaintiff)

M/s C.H.Bade and Company, which had installed “chahoo.com”, claimed that they are global internet media, rendering services under the domain name “chahoo.com” which was registered with the “Net work solution Incorporation”, since 2000. An application for registration of trademark ‘chahoo’ was pending in India.

M/s C.H.Bade and company, further, claimed that they are the first in the field to have a domain name ‘chahoo’, and also to start web directory and provide search services. In June 2000,such directory was named ‘chahoo’.

Mr.C.H.Chote adopted the domain name ‘chahooindia.com’ which is closely resembling to the renowned name ‘chahoo.com’.It was found that the internet users, who wanted to use ‘chahoo.com’ may reach to the ‘chahooindia com.’ Hence, they claimed that the act of Mr.C.H.Chote is dishonest and was tantamount to ‘cyber squatting’.

Mr.C.H.Chote claims that-

1. Plaintiffs trademark was not registered in India, therefore, there could not be any action for infringement of registered trade mark.
2. There could not be an action of passing off as the defendants were not offering goods but services.
3. The persons using internet and seeking to reach the internet site were all technically educated and literate persons. As such there is no chance of deception and confusion.

Discuss the claims of the parties and their legal rights with reference to Cyber Laws and I.T. Act.

CASE NO.4.

Mr.X an industrialist, manufacturer of pens, chalks, dusters and other education materials. There has been a persistent complaint from the customers that the chalks manufactured by him, have a lot of dust and it is troublesome to clean the board after writing. The Research and Development division of Mr.X came up with an innovative chalks. The chalks are absolutely dust free and the writing of the chalks gets vanished automatically after certain time.

Mr. X applied for registration of the patent for this product and has got the patent. Subsequent to the patent granted, he continued with the production for five years after which he stopped the production. The reason was the lack of demand because of the heavy cost of the product.

Mr. Y a College lecturer independently made research on the similar type of chalks and came out with the same quality chalks with much less cost. He applied for patents which was objected by Mr.X on the ground that-

- * Patent for the same product is registered in his name.
- * The product developed by Mr.Y is not an innovative but it is the imitation of his patented product.

Mr.Y claimed that-

- * The product patented by Mr.X is not in use as he has stopped the production.
- * The product invented by Mr.Y is different than that of Mr.X's product in many respects such as shape, quality, cost, etc.
- * Mr.Y who is a lecturer in a Government college, has carried out the research on this product as a part of his academic work.
- * He wants to produce the chalks exclusively for the Government colleges.

Discuss the rights of Mr.X and Mr. Y as per the provisions of Patents Act 1970.

CASE NO.5.

Hindustan Level Limited (Plaintiff) is the leading manufacturer of various kinds of soaps, detergents, chemicals, etc. The different products of the company are sold under the brand names and the company enjoys considerable good will and reputation in the market.

Godrej Soaps Limited (Respondent) also a manufacturer of the various brands of soaps and detergent and is one of the competitors of the plaintiff company.

The plaintiff company holds and owns more than 171 active patents granted by the Government of India under the Patents Act. The company claims that the respondent has access to the specification of Patent number 170171 and they have wrongfully and illegally copied and materially utilized the patented information resulting infringement of the said patent of the petitioner.

It is further claimed by the petitioner that – The toilet soap of the Respondent has been sold under the trade mark VIGIL has a wrapper bearing the words “ALL NEW” “LONGER LASTING SOAP” . This misleads and make the trade and public believe that the toilet soap is an improved product. Such wrongful and illegal acts of the Respondent cause to the Petitioner company an irreparable loss, damage and injury.

The Respondent company claims that-

- * It is a multinational company and a pioneer in the field of manufacturing of toilet soaps in India for the last 60 years.
- * The respondent company has been utilizing various admixtures of various soaps They did not apply for patent for such admixture, as the substance obtained is not an invention.
- * The patent in question is a new one, the validity of which is under serious dispute of challenge.
- * If the plaintiff is granted an injunction at this stage then, it would enable the plaintiff to appropriate a large chunk of the soap industry to itself and would adversely affect the healthy competition. Discuss the case with reference to the Patents Act.

CASE NO.6.

Copyright is a beneficial interest in movable property in the actual or constructive possession of the owner thereof. The right to copy and distribute commercially such material may be transferred or assigned to any other party with certain returns called as royalty. The intention of the parties whether it was an assignment or a grant of permission to use in the normal course, be gathered from the writing itself and the words used therein.

Gramophone Company of India Limited the plaintiff, entered into an agreement with Shanti Films Corporation, a film producer. According to the agreement the copyright in the soundtrack of a film produced by the Shanti Film Corporation (Defendant) was assigned by it to the plaintiff. The plaintiff by the agreement got the exclusive right to produce records, tapes etc. of the film and sold the copies thereof.

However, it was found that Shanti Film Corporation has been selling the copies of the soundtrack and of the films. Hence, the plaintiff filed a suit against defendant for permanent injunction against the infringement of the copy right and also filed an application for temporary injunction.

The plaintiff claimed that the agreement prima –facie reveals that there is an assignment of copyright of the soundtrack in its favour. There are no restrictions to use the copyright. Therefore, the publication of soundtrack of the film in question or reproduction of records without its authority, will prima facie be infringement of copyright. However the defendant denied the claim stating that it is their own production and hence, no one can stop them for reproduction.

Discuss the issue with reference to the relevant provisions of the Copyright Act.1957.

CASE NO.7

Chair India Limited is a leading and renowned manufacturer of chairs. The company has a registered trade-mark in Part A of the Register. The company has cross the turnover of Rupees. 5.00 crores. However, during the last five years it has been observed that the sale has started declining sharply. Hence, the company recently initiated a market research to find the causes for the decline in the sales.

It was found that two companies – one is at Pune itself and another at Hyderabad, are selling their products under the same trade mark. This type of sale of these two companies has directly affected sale in these two regions.

The management is thinking to take a legal action. Advise the management of Chair India Limited as to their rights and remedies along with the provisions in respect on offences and penalties under the Trade and Merchandise Marks Act.1958.

CASE NO.8

World Trade Organisation many a time is called by many people as a Wrong Trade Organisation. The same feeling was demonstrated by many organizations particularly labour organisations.

It is said that it is a Wrong Trade Organisation because it involved in itself with trade which spoilt the environment and promoted unacceptable working conditions for labourers in the poor countries. It is felt that, World Trade Organisation causes greater damage to the global environment. The main claim of the demonstration at Seattle was that World Trade Organisation is not doing anything to ensure that the products produced in adverse working conditions in different countries do not enter into the stream of globally traded items. The question is whether it is that the World Trade Organisation should get involved itself with the labour and environment aspects of production and trade ?

There are some who argue that the effort to involve World Trade Organisation with labour and environmental aspect of trade and production is actually a part of larger effort by some developed countries. The obvious reason is that the poor countries have lower production cost because of cheap labour and not very high quality working conditions. This enables the poor countries to lead the global market over the rich countries.

If both these claims are said to be correct then, World Trade Organisation is deemed to be influenced and controlled by the wrong people.

Discuss in detail-

1. The basic limitations of World Trade Organisation ;
2. to what extent the World Trade Organisation should and can interfere with the working conditions ?
3. is it fair to call World Trade Organisation as a Wrong Trade Organisation ?

CASE NO. 9 :

Tata Oil Mills Company Limited (TOMCO) and Hindustan Lever Limited (H.L.L.) which is a subsidiary of Unilever (U.L.)-a multi-national company – are the manufacturers of soaps, detergents etc. TOMCO was incurring losses from 1990-91 and as such was graded as a sick company. The Board of Directors of TOMCO decided to amalgamate their company with H.L.L. which was a more prosperous company in the same field of activities.

Case 10

Shri Sameer Sonar, scientist involved in space research discusses a scientific principle with his colleague. The colleague shri P.C.Sharma uses the principle and invents working device based on the principle. A third colleague, Shri A.K Bhat who was instrumental in suggesting the manner of putting in place the arrangement of the mechanical devices claims himself to be the true and first inventor and applies for the patent.

Questions

- a) Discuss the relevant provisions in relation to this case.
- b) Is he entitled to apply for the patent?
Incase not, who out of the three, can apply for the patent?

Case -11

Dr.P.M Desai,a Doctor in All India Institute of Medical Sciences invents a machines which can delivered a glucose to a patient through the skin by causing the pores of the skin to absorb glucose and deliver it to the blood stream. The claim of the doctor of such and invention is rebuked by medical community as being highly improbable and useless in invention. However , when the invention is put to demonstration it is found to be indeed effective and is claimed by the doctors to be highly useful method of treatment of diabetes by regulating the amount of glucose supply to the blood. Now that the invention has been hailed by the medical community, as being a new useful and non-obvious method of treatment.

Questions

- a) Discuss the label of provisions in relation to this case as per Patent law.
- b) Can the doctor claim a Patent in the invention?

Trade Marks

CASE-12

NOTE- A mark which is 100% distinctive has a right to registration.

Shri S.P.Morgan started using the mark CONTAINER as a trade mark for freight containers. He spent huge amounts on advertisement. His freight containers become very popular in the market after ten years he applied for registration on the ground of acquired hundred percent distinctiveness in respect of his goods. The registrar refused registration of the trade mark objecting that the trade mark was a descriptive word directly indicating the nature and character of the goods of the trader

Questions

- a) Discuss the trade mark and provisions necessary for registration of trade marks.
- b) Can the trader oppose the registrar's objections in this case?

Case –13

Two parties applied for registration of Trade mark. Shri Ghanashyam and Shri Dhanashyam applied for registration of trade mark . They were both rivals. The trade used by these rivals were “Mathura Ghee and Mathurang Ghee” respectively.

Shri Dhanashyam started using ‘Mathurang’ after lapse of five years from the use of trade mark ‘Mathura Ghee’ by Shri Ghanashyam. Shri Ghanashyam has polarized the trade mark ‘Mathura Ghee’ by investing huge amounts on advertisement. The two trade names were phonetically similar. There was not much difference in pictorial and monogram that is the trade mark of the rivals. The only difference was the word ‘G’ registration was granted to neither.

Questions

- a) Discuss in the light of Trade mark provisions in this case
- b) Suggest the plaintiff regarding use of trade mark

Copyright

Case -14

Shri Anand wrote a play entitled 'Hum Hindustani' in 1983. The play was enacted in the next few years in Delhi and Mumbai. It got good reviews in newspapers the play was based on the theme of provincialism & its baneful and divisive effects on the society. A film maker, Mr. Mohan Sehgal become interested in making a film based on the play. He heard the play from Shri Anand in his office. Shri Mohan did not receive further communication from Mr. Sehgal. There after, Mr Sehgal announced the production of a film 'New Delhi'. The picture was released in September 1986. From comments in the press Shri Anand felt that the film was very much like his play, 'Hum Hindustani'. Thereafter, Shri Anand himself saw the picture & felt that the film was entirely based on his play. He felt that Shri Sehgal had dishonestly imitated the play in the film & violated his copyright. He therefore moved the court.

Mr. Sehgal (Relux films) claimed that they had communicated to Shri Anand that the play might have been all right for the amateur stage but it was too inadequate for the purposes of making a full length commercial motion picture. The key arguments of Relux Films was that they could be no copyright on the subject or idea of provincialism. Any one can adopt to in his own way. They claimed that the motion picture was quite different from the play 'Hum Hindustani' in its content, spirit & climax. Some similarities could be explained by the fact that both were based on the idea of provincialism.

Questions

- A) Discuss on the above case in the right of provisions of the copy right law.
- B) Shri Anand wants to take action in court of law Advice Shri Anand.

OR

- C) If you are judge, how will you treat these case.

CASE-15

A public library gets a copy of a book authored by a foreign author published abroad. Due to high price of the book the library gets 6 copies of the books made.

Questions

- A) Discuss in the light of above case the provisions of copy right law.
- B) If the library guilty of infringement? If yes? How & why? If no, why not?
- C) Can it avoid an action of infringement by reducing the number of copies? If so how many copies are the library authorized to keep without infringing the copyright of the author?

RTI-

CASE-16

Shri S.D.Gore files an application & seeks following information about Shri M.D.Kale from Public Information Officer.

- A) What is the gross turnover of Shri M.D.Kale during the preceding 3 years?
- B) How much sales tax has been paid by him?
- C) What ingredients does he use in preparation of his products and in what ratio?

Questions-

- A) Discuss the sections of RTI & comment whether such information can be provided or not?
- B) Discuss which type of information can be given.

RTI

CASE-17

Mrs. Madhu Bhaduri filed a RTI with the Delhi Jal Board (DJB). Her mother lives in Hauz Khas, block K & has been complaining about a blocked sewer for a month. Mrs. Bhaduri spoke to the Junior Engineer (JE) to get the matter looked into as the block had started to stink & mosquitoes had become a big problem. The Engineer simply said he'd look into the matter & that the DJB was using very heavy machinery to rectify the problem, & then he did nothing.

Finally, when nothing else seemed to be working, Mrs. Bhaduri filed a RTI application in which she wrote:

For an entire month the sewerage system of blocked P& K has been blocked. On December 7, I spoke to the JE & was assured that the situation will improve and that the DJB has been using heavy machinery to rectify the problem.

So far no action has been taken. Our complaints have only been answered through false reassurances that the problem will be taken care of. As a result of the slack behavior, the residents are compelled to live in unhygienic conditions: our entire block smells and has become a breeding ground for mosquitoes.

Please provide the following information:

- a) What has been the daily progress made on our complaint made to the junior Engineer on December 7, 2009?
- b) Provide names & designations of officers in charge of handling my complaint.
- c) Provide copy of inspection report prepared on the complaint.
- d) What departmental action will be taken against defaulting officers?
- e) What is the stipulated time of responding to public grievances?
- f) What is/are the reason (s) for the sewer being blocked in our area? What are the steps taken to solve this problem?
- g) Provide names of officers who are responsible for the stink in our block as a result of the blocked sewer.

Questions

- A. Discuss the provisions of RTI in relation to above case.
- B. Will the officers be responsible for health risks that the residents are being exposed to as a result of not acting on our complaint?

C. Will the DJB reimburse the medical bills for health problems caused to the residents for the month of December 2009? How? Please provide details of procedure.

M.Com. Part II-Sem. IV (Pattern 2008)
w.e.f. 2009-10
Subject – Project Work / Case Studies
Paper VIII (404)
Business Laws and practices

There will be a project work carrying 100 marks for internal student only. The students will have to select a subject form any area of the syllabi for commercial Laws & practices. The students will have to work under the guidance of concerned subject teacher. The project will carry 100 marks out of which sixty marks will be allotted for Project Report and 40 marks will be allotted for project Viva-Voce to be conducted by internal teacher and external teacher (examiner)appointed by the University.

The list of Project :

1. A study of efforts taken by the private agencies or Government agencies for export of agriculture produce and its impact.
2. A study of Impact of E-commerce on working of Pune Stock Exchange.
3. A study of Maharashtra State Agriculture Marketing Board, Pune in respect of export of agriculture produce.
4. A study of Patent Law and procedural aspect in the era of Globalization.
5. A study of Cyber crimes related issues With Special Reference to Pune City.
6. A study of Globalization and its effect on local industries.(Choose any specific factory or industrial unit).
7. A study of problems in respect of procedure and practices of registration of the patents.
8. A study of copyright awareness & causes of piracy in Pune City.
9. A study of Impact of E-commerce on the banking sector with special reference to some selected banks in Pune district.
10. A study of export procedure of Indian Agricultural product in WTO regime.
11. A study of Patent Act, 2005 with special reference to recent amendments.
12. A study of WTO and impact of HongKong ministerial conference on India.
13. The impact of WTO on Indian education.
14. A study of online trading of few selected broking companies in Pune.
15. A study of impact of WTO on international business.

16. A study of impact of trade marks on traders and consumers.
17. A study of general awareness of cyber cafe owners/occupiers about cyber law and cyber crime.
18. A critical analysis of the concept of 'Novelty' as an essential criteria of patentability: A study of UK, US and Indian position.
19. A study of concept of originality under copyright Law and judicial responses.
20. A study of working of Pune Police cyber cell.
21. A study of regulatory mechanism of foreign direct investment.
22. A study of benefits and limitations of internet banking.
23. A study of benefits and limitations of internet advertising.
24. A study of efforts of the government agencies in protection of bio-diversity.
25. A study of importance of protection of Intellectual property rights for Indian industries.
26. A study of RTI cases and its implementation.

-----XOX-----

China Telecom Corporation, the world's largest operator of fixed-line communications, was formed when the state owned China Telecommunications Corporation reorganized. China Telecom employs 350,000 workers throughout China, who attend to the company's operations in domestic and international fixed-line networks; fixed-line voice, data, and information services; and the settlement of international telecommunications accounts. The company has maintained steady growth despite heavy competition from mobile phone services.



In 2002, the company became a public company listed on the New York Stock Exchange (NYSE). That same year, the United States (US) granted China Telecom a license to provide international telephone and Internet service between the countries. These steps were part of a transition from a traditional state-run enterprise to a modern enterprise based on larger profits and a wider customer base. However, to succeed as an international telecommunications powerhouse, China Telecom had to solve several problems. First, the company required a state-of-the-art IT infrastructure. Second, it needed to comply with international reporting regulations for publicly traded companies. Third, it needed to integrate all of its business functions and enable real-time management. Together, these initiatives would increase organizational efficiency, tighten control over internal operations, and promote better collaboration among different departments.

For a solution, China Telecom decided to invest in [Enterprise Resource Planning](#) (ERP) software. The company could have written its own software to link its different business functions and organizational units, but this would have been very costly and time-consuming. It was much easier to use an [ERP software package from a recognized vendor](#). The software is based on best-practice business processes, which would help the company meet international reporting requirements.

According to Shiping Liang, director of the application division at China Telecom, the company chose MySAP ERP from SAP as the backbone system because of its powerful functionality and [integration capabilities](#). Among the core business processes that MySAP ERP supports for China Telecom are engineering project management, finance, [controlling](#), [procurement](#), and [human capital management](#). SAP's ERP financials module supports local currencies, markets, and languages, including Chinese. The SAP [human capital management module automates human resources processes](#) and integrates them across global operations. The software meets regulatory requirements for more than 50 countries.

To promote data integration, China Telecom also adopted two components of SAP Netweaver: SAP Business Intelligence (SAP BI) and SAP Enterprise Portal (SAP EP). SAP Netweaver uses

XML and Web services to link the enterprise system with a company's existing systems to create new cross-functional applications. SAP Enterprise Portal provides a single point of access to data from multiple systems, integrating the data in a single view for the user. SAP Business Intelligence provides data warehousing capabilities to integrate business data from multiple sources for company-wide reporting.

After considering a number of vendors, China Telecom selected [Hewlett-Packard](#) (HP) hardware to run its ERP software because of its scalability, flexibility, low total cost of ownership, and ability to support SAP. Specifically, China Telecom chose the HP 9000 server family to run its SAP applications and HP StorageWorks XP128 Disk Array for its network storage infrastructure. Eventually, more than 30,000 employees will use the SAP and HP solution at more than 20 China Telecom subsidiaries. The deployment of the SAP software reflects the needs of each subsidiary. For example, most of China Telecom's business comes through Guangzhou and Shanghai, so those offices will use the financial, operations, human capital management, and analytic capabilities of MySAP ERP. The headquarters in Beijing will use MySAP ERP to run human capital management functions to [centralize human resources management](#) and consolidate enterprise-wide information.

The integration of data from MySAP ERP has accelerated the flow of information among accounting, procurement, and engineering management functions and encouraged collaboration among departments. Integration of data between the human resources and accounting functions facilitates analysis of personnel costs and [performance-based compensation plans](#), which were previously very time-consuming. The software provides users with quick and easy access to unified data and applications through a Web browser. The hardware platform has stood up to the test of making large volumes of critical data available 24/7.

Going forward, China Telecom will focus on using MySAP ERP to further integrate with other systems so the company has a complete view of all its processes with customers, employees, and supply chain partners.

Questions to Discuss:

1. What problems did China Telecom face? How did these problems affect China Telecom's business? How has the company chosen to solve these problems?
2. What other solutions might the company have tried? Analyze the solution that China Telecom chose from the people, technology, and organization perspectives.
3. Did China Telecom choose the best solution? Explain your answer.

A waiter takes an order at a table, and then enters it online via one of the six terminals located in the restaurant dining room. The order is routed to a printer in the appropriate preparation area: the cold item printer if it is a *salad*, the hot-item printer if it is a hot *sandwich* or the bar printer if it is a *drink*. A customer's meal check-listing (bill) the items ordered and the respective prices are automatically generated. This ordering system eliminates the old three-carbon-copy guest check system as well as any problems caused by a waiter's handwriting. When the kitchen runs out of a food item, the cooks send out an 'out of stock' message, which will be displayed on the dining room terminals when waiters try to order that item. This gives the waiters faster feedback, enabling them to give better service to the customers. Other system features aid management in the planning and control of their restaurant business. The system provides up-to-the-minute information on the food items ordered and breaks out percentages showing sales of each item versus total sales. This helps management plan menus according to customers' tastes. The system also compares the weekly sales totals versus food costs, allowing planning for tighter cost controls. In addition, whenever an order is voided, the reasons for the void are keyed in. This may help later in management decisions, especially if the voids consistently related to food or service. Acceptance of the system by the users is exceptionally high since the waiters and waitresses were involved in the selection and design process. All potential users were asked to give their impressions and ideas about the various systems available before one was chosen.

Questions:

1. In the light of the system, describe the decisions to be made in the area of strategic planning, managerial control and operational control? What information would you require to make such decisions?
2. What would make the system a more complete MIS rather than just doing transaction processing?
3. Explain the probable effects that making the system more formal would have on the customers and the management.

Solution:

1. A management information system (MIS) is an organized combination of people, hardware, communication networks and data sources that collects, transforms and distributes information in an organization. An MIS helps decision making by providing timely, relevant and accurate information to managers. The physical components of an MIS include hardware, software, database, personnel and procedures.

Management information is an important input for efficient performance of various managerial functions at different organization levels. The information system facilitates decision making. Management functions include planning, controlling and decision making. Decision making is the core of management and aims at selecting the best alternative to achieve an objective. The decisions may be strategic, tactical or technical. Strategic decisions are characterized by uncertainty. They are future oriented and relate directly to planning activity. Tactical decisions cover both planning and controlling. Technical decisions pertain to implementation of specific tasks through appropriate technology. Sales region analysis, cost analysis, annual budgeting, and

relocation analysis are examples of decision-support systems and management information systems.

There are 3 areas in the organization. They are strategic, managerial and operational control.

Strategic decisions are characterized by uncertainty. The decisions to be made in the area of strategic planning are future oriented and relate directly to planning activity. Here basically planning for future that is budgets, target markets, policies, objectives etc. is done. This is basically a top level where up-to-the minute information on the food items ordered and breaks out percentages showing sales of each item versus total sales is provided. The top level where strategic planning is done compares the weekly sales totals versus food costs, allowing planning for tighter cost controls. Executive support systems function at the strategic level, support unstructured decision making, and use advanced graphics and communications. Examples of executive support systems include sales trend forecasting, budget forecasting, operating plan development, budget forecasting, profit planning, and manpower planning.

The decisions to be made in the area of managerial control are largely dependent upon the information available to the decision makers. It is basically a middle level where planning of menus is done and whenever an order is voided, the reasons for the void are keyed in which later helps in management decisions, especially if the voids are related to food or service. The managerial control that is middle level also gets customer feedback and is responsible for customer satisfaction.

The decisions to be made in the area of operational control pertain to implementation of specific tasks through appropriate technology. This is basically a lower level where the waiter takes the order and enters it online via one of the six terminals located in the restaurant dining room and the order is routed to a printer in the appropriate preparation area. The item's ordered list and the respective prices are automatically generated. The cooks send 'out of stock' message when the kitchen runs out of a food item, which is basically displayed on the dining room terminals when waiter tries to order that item. This basically gives the waiters faster feedback, enabling them to give better service to the customers. Transaction processing systems function at the operational level of the organization. Examples of transaction processing systems include order tracking, order processing, machine control, plant scheduling, compensation, and securities trading.

The information required to make such decision must be such that it highlights the trouble spots and shows the interconnections with the other functions. It must summarize all information relating to the span of control of the manager. The information required to make these decisions can be strategic, tactical or operational information.

Advantages of an online computer system:

- Eliminates carbon copies
- Waiters' handwriting issues
- Out-of-stock message
- Faster feedback, helps waiters to service the customers

Advantages to management:

- Sales figures and percentages item-wise
- Helps in planning the menu
- Cost accounting details

2. If the management provides sufficient incentive for efficiency and results to their customers, it would make the system a more complete MIS and so the MIS should support this culture by providing such information which will aid the promotion of efficiency in the management services and operational system. It is also necessary to study the keys to successful Executive Information System (EIS) development and operation. Decision support systems would also make the system a complete MIS as it constitutes a class of computer-based information systems including knowledge-based systems that support decision-making activities. DSSs serve the management level of the organization and help to take decisions, which may be rapidly changing and not easily specified in advance.

Improving personal efficiency, expediting problem solving (speed up the progress of problems solving in an organization), facilitating interpersonal communication, promoting learning and training, increasing organizational control, generating new evidence in support of a decision, creating a competitive advantage over competition, encouraging exploration and discovery on the part of the decision maker, revealing new approaches to thinking about the problem space and helping automate the managerial processes would make the system a complete MIS rather than just doing transaction processing.

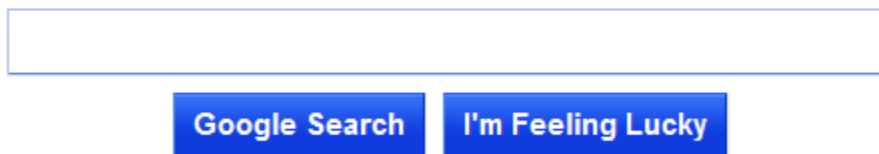
3. The management system should be an open system and MIS should be so designed that it highlights the critical business, operational, technological and environmental changes to the concerned level in the management, so that the action can be taken to correct the situation. To make the system a success, knowledge will have to be formalized so that machines worldwide have a shared and common understanding of the information provided. The systems developed will have to be able to handle enormous amounts of information very fast.

An organization operates in an ever-increasing competitive, global environment. Operating in a global environment requires an organization to focus on the efficient execution of its processes, customer service, and speed to market. To accomplish these goals, the organization must exchange valuable information across different functions, levels, and business units. By making the system more formal, the organization can more efficiently exchange information among its functional areas, business units, suppliers, and customers.

As the transactions are taking place every day, the system stores all the data which can be used later on when the hotel is in need of some financial help from financial institutes or banks. As the inventory is always entered into the system, any frauds can be easily taken care of and if anything goes missing then it can be detected through the system.

Success Story of Google Search Engine

One of the most popular search engines is Google. Unknown to many, the term is coined by Milton Sirotta, the nephew of Edward Kasner who is an American Mathematician. The term is in reference with the number which is represented by the number 1 followed by 100 zeros. The same utilization of the term reflects the mission of the company to deliver immense and infinite resources to be available online.



The founders of the company, Larry Page and Sergey Brin, were not in good terms back then when they met as graduate students of computer science in Stanford University in 1995. They used to argue on everything that they are discussing. The strong personalities always clashed. But eventually, they have found a common ground. The retrieving of various yet important information from massive set data has been the big challenge that they were up to at that time. So, on January 0f 1996, they began the collaboration of BackRub, the name they have formulated because of the unique approach to back links to a given website. Larry procured the use of low-end PCs instead of the big yet very expensive machines. After a year, the news about the newest search engine spread around the campus. Then, they began to search for the perfection of their technology. They were encouraged to put up their service of a search engine company by themselves.

They talked to [Andy Bechtolsheim](#), one of the founders of the [Sun Microsystems](#), after the demo, he thought that Google has a lot of potential so he decided to lend them \$100,000. The initial investment has been raised to almost \$1million and became their road to success. In September of 1998, the Google Inc. opened up in Menlo Park, California.

Still in beta, and was already called Google.com, they were receiving 10,000 search queries each day. Then, this has moved Google in the world.

Basically, what is Google? The improvement of the different ways that people can find, connect and use information is what Google is focused on. They are maintaining a very large index of websites online in inclusion are the content and by utilizing the search engine, the information can be generated freely and almost instantly to everyone with the Internet connection. The revenue of Google is primarily from the cost-effective advertising online. The different business in the world is utilizing the AdWords, a program that is promoting the products and services with the targeted users. Furthermore, the Google AdSense is being utilized by thousands of third-party websites to deliver the AdWords ads that generate the revenue and improves the user experience.

On the other hand, the mission statement of Google is organizing the different information in the world and makes it accessible, available and useful to the users. Basically, the mission of Google is obtaining different information by investigation, study, measurement numerical quantities and even data. This has been proved by their PageRank, Link Measurement, Algorithm, and Profiling. As of today, Google become one of the most widely known brands around the world from the mouth of all the satisfied users.

The mission of Google is primarily focused on the users. Ultimately, it is because to become very profitable, the needs of the users must be accomplished. This is due to the fact the word-of-mouth promotion is very strong specifically if the user gain a high and quality user experience. They have incorporated their three key commitments. First, they will be providing useful and important information as part of the search results independent of the financial gain of the company. It means that they will be providing the search results objectively at no price to the businesses; they will not be accepting any kinds of payment for the inclusion in the search results. Second, they will be promoting the most essential and useful advertising in Google. The

ads will not be annoying to the users and so as not to interrupt their businesses online. If ever there will be monetary influenced on the advertisements, they will be informing the users. Lastly, Google will never stop to improve and enhance the user experience in the areas of their command, the search engine and others in the information technology aspects.

The mission of Google is basis of their success. In inclusion is the critical procurement of the long-term value. The principle of the company in not compromising the user experience in exchange of a short-term financial gain has added to their success in the world.

Through the implementation of the mission of Google, they have reached a progress in user service such as utilizing more than 300 factors in ranking websites, the online contents vary 20 percent every month, and the world's information is currently 10% online. In addition, they will check millions of library projects to make them accessible right through the browsers.

True enough, putting up all the world's information could take at least 300 years. But Google is fast fixing everything that could hinder their service and eliminate the bugs that might lengthen the 300 years. In figures, the Google engineers, comprising of 70 percent in the company are all working in the different search related problems. A lot of employees are standing tall in improving the automatic translation tools.

The clients of Google is basically the hundreds of thousands businesses who are up to advertising their very own products. They are utilizing the Google AdWords that allow them to reach their targeted millions of users around the world. In inclusion, their products are centered on continuous technology innovation with frequent beta version for improvements. Once they are satisfied with the results, they will be removing the "beta" label. Some of the Google products are the Google Web Search, Google Desktop, Google Adwords, Gmail, Google AdSense, Google Earth, Google News, Google Finance, Google Maps and the Google Enterprise.

In the proliferation of their service to the users in delivering the information of the world right in the browsers, Google has meet up several opposition from other companies, groups and individuals. Google has been scanning libraries to provide the different information over the Internet. In doing so, they are open in the copyright infringement. People are stating that Google should back down in scanning without the proper permissions. Even they are in a solid

ground to do so, they must be putting things off until they can think of a way to have an automated way of seeking the author's permission.

Personally, the success of Google is immeasurable, but the let's just do it attitude must be eliminated so as not to have any bad tag as the copyright bad guy. The protection of Google to the copyright of the things they published over the Internet is weak. The promotion that they are after has been reached but the digital copies were not really secured. Anyone who is familiar with YouTube must know this. Many companies are in protest since the site is tolerating piracy as it published in the web the different movies, television parts. True enough, Google must find a way to minimize and further eliminate the massive infringements in YouTube, in addition is for them to formulate a method wherein the published materials can have an automated way of seeking the necessary information from the authors.

By following up to the philosophy of the company which is never settling for the best but instead focus on perfection, Google has reached a status in the business and information technology world. Google's goal is to primarily improve further to a higher level of service to everyone seeking the world's information everywhere.

To top it all, the persistence of the company for continuous excellence and innovation makes them the leading standard. The company has helped to redefine the value of how the individuals, businesses and technologists see the Internet.

Despite the fact that there are Google products that has nothing to do with search technology, the truth remains that these help fund Google in maintaining and organizing the search engine. The path that Google is taking has been a very good start in the promotion of accessible information. True enough, there would be opposition from another groups or entity, but in the improvements of their technology, standing in the solid legal grounds will make them come out clean. The best thing that they can do is to minimize and then eliminate the not-so-good features in their services. Thus, it would better improve their integrity, at the same time, their financial gain.

CASE STUDY -1

Tangy spices Ltd, the countries' biggest spices marketer has decided to launch a hostile bid for Italy's major spice marketer Chilliano. This is a rare case of an Indian company making an unsolicited hostile bid for a foreign company. The Tangy Spices Ltd. has competencies in Indian spices. The major destination markets for the Tangy spices Ltd. exports have been the Europe and America. The competencies of Chilliano lie in Italian herbs and spices. The Indian company with the takeover wishes to synergies its operations in the world market. It also wants to take advantage of the reach enjoyed by the Italian company in several countries where its products are not being sold presently.

The move of hostile takeover follows Chilliano's rejection to an agreement entered a year back. At that time Chilliano was suffering losses and it offered majority shares at a price of € 2.25. A total of 20% shares were transferred at that time. In one year Chilliano was able to turnaround its operations and the company made handsome profits in the last quarter. The promoters who have residual holding of 35% in the company are reluctant to transfer the shares now. They have rejected the agreement with a plea that the earlier offer price was not sufficient.

Tangy spices Ltd has revised its offer to € 2.95. By this lucrative offer some of the large shareholders of Chilliano reveal their interest for selling their stakes. On the other hand, promoters maintained their position on this matter. Through the process of buying of shares in the market the Tangy spices Ltd. gradually consolidated its holding in Chilliano to 45%. Being a major shareholder they were ready for a takeover. At the same time, Tangy spices Ltd. was trying hard to improve their position so that they do not leave any space for Chilliano's promoters in future.

Read the above case and answer the following questions:

Q (1) What strategic alternative is followed by Tangy spices Ltd?

There are different general strategic alternatives which are also known as Grand Strategies.

- (1) Stability
- (2) Expansion
- (3) Retrenchment
- (4) Combination

Expansion is the most popular strategy followed by organization. In expansion strategy, organizations can expand their operations through acquisition route.

Here Tangy Spicy Limited is following up the expansion strategy by acquiring the Chilliano of Italy.

Q (2) Is the hostile takeover by an Indian company appropriate?

Hostile takeovers are extremely expensive. Acquirer need to be ready to pay extra price than market price of equity. It should be done when a cash rich company sees strategic advantage in that acquisition. Indian companies can do the hostile takeover provided that takeover help them to position much stronger in the market. Additionally, price paid for takeover should be in line with the strengths or values to be achieved from that takeover.

For example, Corus acquisition by TATA STEEL is an example of hostile takeover but takeover positioned the TATA as market leader in steel manufacturing capacity and technologies. So looking at this takeover, it seems if hostile takeover is done with proper long-term strategy than it is quite appropriate for the Indian companies.

Q.(3) Why the Tangy Spices Ltd. is interested in this takeover?

The Tangy Spices Ltd. has competencies in Indian spices. The major destination markets for the Tangy

spices Ltd. exports have been the Europe and America. The competencies of Chilliano lie in Italian herbs and spices. Tangy with this takeover will synergies its operations in the world market, particularly in Europe and America—its major exports markets. It also wants to take advantage of the reach enjoyed by the Italian company in several countries where its products are not being sold presently.

Further, rejection of promoters to transfer the shares as agreed in an agreement entered a year back also prompted the Tangy to go for his takeover.

Q.(4) Why the promoters are reluctant to transfer the shares after the agreement?

Around a year back, the promoters of Chilliano had agreed to transfer the equity share to Tangy at € 2.25 per share. But in one year, Chilliano was able to turnaround its operations and the company made handsome profits in the last quarter. The promoters who have residual holding of 35% in the company become reluctant to transfer the shares now. They have rejected the agreement with a plea that the earlier offer price of € 2.25 per share was not sufficient. So, it is a case where promoters either feel that they are not getting right value for their equity or they do not intend sell equity due to increased profitability of company in the recent past.

CASE STUDY-2

Meters Limited is a company engaged in the designing, manufacturing, and marketing of instruments like speed meters, oil pressure gauges, and so on, that are fitted into two and four wheelers. Their current investment in assets is around Rs. 5 crores and their last year turnover was Rs. 15 crores, just adequate enough to breakeven. The company has been witnessing over the last couple of years, a fall in their market share prices since many customers are switching over to a new range of electronic instruments from the angle of mechanical instruments that have been the mainstay of Meters Limited.

The Company has received a firm offer of cooperation from a competitor who is similarly placed in respect of product range. The offer implied the following:

- (i) transfer of the manufacturing line from the competitor to Meters Limited;
- (ii) manufacture of mechanical instruments by Meters Limited for the competitor to the latter's specifications and brand name; and
- (iii) marketing by the competitor.

The benefits that will accrue to Meters Limited will be better utilization of its installed capacity and appropriate financial compensation for the manufacturing effort. The production manager of Meters Limited has welcomed the proposal and points out that it will enable the company to make profits. The sales manager is doubtful about the same since the demand for mechanical instruments is shrinking. The chief Executive is studying the offer.

Read the above case and answer the following questions:

Q.(1) What is divestment strategy? Do you see it being practised in the given case? Explain.

Divestment strategy involves retrenchment of some of the activities in a given business of the company or sell-out of some of the businesses.

This strategy is largely followed in the following cases

Obsolescence of product/process

Business becoming unprofitable

High competition

Industry overcapacity

Retrenchment Strategy also includes turnaround of declining business operations.

I don't believe this is being completely followed over here. The company is mainly planning a turnaround of business operation through manufacturing other organization's products in order to better utilize the manufacturing capacity. However, it seems customers are switching from mechanical instruments to electronic instruments, so this strategy should not be viewed as turnaround of business operations or divestment strategy.

Q.(2) What is stability strategy? Should Meters Limited adopt it?

If a firm is opting for stability of business operations by staying in the same business, same product, market and functions, and firm normally maintains same levels of effort as at present, then it is known as stability strategy.

The main aim of this strategy is to enhance functional efficiencies, better deployment and utilization of resources.

Meters Limited should not adopt the stability strategy. In this strategy, Meters Limited will continue manufacturing the mechanical meters with improved utilization of capacity and reduced costs but we know that market is losing customers base for mechanical meters.

Q(3) What is expansion strategy? What are the implications for Meters Limited in case it is adopted?

Expansion strategy is the most popular strategy and most of the business organizations opt for expansion strategy because this strategy prompts for the growth of business organizations.

There are two key types of expansions strategy

- (1) Intensifications
- (2) Diversifications

Both of them are growth oriented strategies; the difference lies in the way by which the firm actually pursues the growth.

Intensification involves the following:

- Product Development
- Market Penetration
- Market Development

Diversification involves the following:

- Vertically integrated diversification
- Horizontally integrated diversification
- Concentric diversification
- Conglomerate diversification

Yes, company should adopt expansion strategy by adopting intensifications category. In intensification strategy, company can initially focus on product development i.e. developing new electronic instruments and then they can follow market penetration and market development

Q.(4) What are your suggestions to the Chief Executive?

My suggestions to chief executive will be the following:

for the time being, till the time new products are developed, we can accept the offer of other organization to manufacture their products for better utilization of capacity but we have to be cautious about competition / sales of products in the same category and that should be properly laid out in the agreement. However, in the long-term, we should focus on new products developments and try to expand product range by including the manufacturing of electronic instruments.

CASE STUDY -3

Sahni Auto Industries is a manufacturer and exporter of Autoparts with an annual turnover of Rupees one thousand crores. It employs about 2,00 persons in its factory in Punjab and its other offices in India and abroad.

The Personnel Administration and Human Resources Department of the company is headed by Mr. Amit Kapoor-the Chief Personnel Manager. Mr. Amit Kapoor, an automobile Engineer joined the company 5 years ago as Product Development Manager. After a successful stint of 4 years as Product Development Manager, he was transferred to Personnel Administration and Human Resources Department as the Chief Personnel Manager as a part of Career development plan. Mr. Vikas, MBA in Human Resources from a renowned Business school, joined the company as Personnel Manager only 3 months back. He reports to Mr. Amit Kapoor-the Chief Personnel Manager. He handles all routine personnel and industrial relations matters.

One day, during informal discussion with Mr. Amit Kapoor, Mr. Vikas suggested him of linking Human Resources Management with Company's strategic goals and objectives to further improve business performance and also to develop Organisational culture that fosters more innovative ideas. He also advocated creating abundant 'Social Capital' on the ground that people tend to be more productive in an environment which has trust and goodwill embedded in it rather than which is highly hierarchical and formal. Mr. Amit Kapoor disagreed with Mr. Vikas and told him that the role of Human Resources Department was only peripheral to the business and all his suggestions about its strategic role were beyond the purview of Personnel Administration and Human Resources Department. After this, Mr. Vikas started having number of arguments with Mr. Amit Kapoor in several issues relating to personnel and industrial relations since he felt that a person with a degree in Human Resources Management was in a far better position to run Personnel Administration and Human Resources Department. Mr. Amit Kapoor--the Chief Personnel Manager had often shown his displeasure on Mr. Vikas's argumentative - tendency and had made it known to the General Manager.

The General Manager called Mr. Amit Kapoor in his office to inform him that he has been elected for an overseas assignment. He further told him to find a suitable person as his successor; he even suggested Mr. Vikas as a possible candidate. Mr. Amit Kapoor, however, selected Mr. Balram, who was working as Training Manager in a Multinational Company for the last 5 years. Mr. Vikas, soon started having arguments with Mr. Balram also over number of issues relating to industrial relations since he felt that he had no experience in handling industrial relations matters. Mr. Balram now realised that Mr. Vikas was trying to make things difficult for him. After a series of meetings with the General Manager, Mr. Balram eventually succeeded in convincing him to transfer Mr. Vikas to an office outside Punjab. On learning about his impending transfer, Mr. Vikas wrote a letter to the General Manager joining details of various instances, when Mr. Balram had shown his incompetence in handling problematic situations. When asked for explanation by the General Manager, Mr. Balram had refuted almost all the allegations. The General Manager accepted his explanation and informed Mr. Vikas that most of his allegations against Mr. Balram were unwarranted and baseless. He further advised him to avoid confrontation with Mr. Balram. Mr. Vikas then wrote a letter to the Chairman repeating all the allegations against Mr. Balram. On investigation, the Chairman found most of the allegations true. He then called all the three--the General Manager, the Chief Personnel Manager and the Personnel Manager in his office and implored them to forget the past and henceforth to work in coordination with each other in an environment of Trust and Goodwill.

Read the above case and answer the following questions:

Q.(1) Identify and discuss the major issues raised in the case.

This case is related with human resources function. The major issues raised in this case can be defined as follows:

Non-linking of Human Resources Management with Company's strategic goals and objectives.

Lack of organisational culture that fosters more innovative ideas.

Highly hierarchical and formal organizational structure which lacks trust and goodwill and thus lacks productivity.

Human Resources Department was treated as peripheral to the business rather than an integrated function for strategic planning and implementation.

Q.(2) Comment on the recruitment of the two Chief Personnel Managers.

The first Chief Personnel Manager, Mr. Amit Kapoor is an automobile Engineer joined the company 5 years ago as Product Development Manager. After a successful stint of 4 years as Product Development Manager, he was transferred to Personnel Administration and Human Resources Department as the Chief Personnel Manager as a part of Career development plan.

I don't see any disadvantage if a capable person without having formal HR qualification being transferred to the HR department. However, over here this transfer is not with an aim to bring some efficiency in the HR function rather it is a simple transfer from one position to another position; which I think is not correct. For example, Mr M. Pillai, a qualified CA, has been made HR director in the Infosys from his earlier position of finance director. This change in position of Mr. Pillai is considering him as most capable person and Infosys now a company with more 1 lakh employee has the HR more challenging task than the finance. Therefore they transferred the most capable person to HR director from finance director.

The second Chief Personnel Manager, Mr. Balram was earlier working as Training Manager in a Multinational Company for the last 5 years. He also has no formal experience and qualifications in the HR management. I don't think his appointment as chief HR manager was also on any merit or to infuse any efficiency in the HR function.

Q.(3) Would you justify Mr. Vikas's argumentative tendency with the Chief Personnel Managers ? Give reasons for your answer.

I agree with Mr. Vikas argumentative tendency with Chief Personnel Managers regarding enhancing role of HR department and industrial relation in the company strategic management. I also agree with his view that Human Resources Management should be linked with Company's strategic goals and objectives. Because I think HR is as equal and important function as finance and marketing; and better HR management helps organizations to achieve their strategic goals and objectives.

But I don't agree with his view that a person with HR qualifications only can better manage the HR department. As said above, Mr M. Pillai, a qualified CA, has been made HR director in the Infosys from his earlier position of finance director. This change in position of Mr. Pillai is considering him the most capable person and Infosys now a company with more 1 lakh employee has the HR management more challenging task than the finance management.

Q.(4) Do you agree with suggestion offered by Mr. Vikas to Human Resources Management with the company's strategic goals ? If yes, suggest prominent areas where Human Resources Department can play role in this regard.

Yes, I agree with suggestion offered by Mr. Vikas to Human Resources Management with the company's strategic goals. In the the following area the HR department can play a role in this regard:
Providing purposeful direction: The human resource management can lead people and the organization towards the desired direction. The HR manager has to ensure that the objectives of an organization become the objectives of each person working in the organization.

Creating competitive atmosphere: By creating committed and competitive atmosphere through opportunities for employees.

Facilitation of change: The Human resources are more concerned with substance rather than form, accomplishments rather than activities, and practice rather than theory. The human resources should be provided enough opportunities for the same.

Diversified workforce: In the modern organization management of diverse workforce is a great challenge. Workforce diversity can be observed in terms of male and female workers, young and old workers, educated and uneducated workers, unskilled and professional employee, etc. creating a great culture or non-financial incentives also plays an important role in motivating the workforce.

Empowering human resources: Empowerment means authorizing every member of a society or organization to take of his/her own destiny realizing his/her full potential.

Building core competency: The human resource manager has a great role to play in developing core competency by the firm. A core competence is a unique strength of an organization which may not be shared by others in the form marketing and technical capability.

Developing ethical work culture: A vibrant work culture should be developed in the organizations to create an atmosphere of trust among people and to encourage creative ideas by the people.

1. Case Study: GoDaddy's Super Bowl Commercials

Bob Parsons sold his first successful company, Parsons Technology, in 1994, and in 1997 he used the proceeds to start a new company, Jomax Technologies. Unsatisfied with the Jomax name, Parsons and his staff came up with the more arresting moniker Go Daddy. As Parsons told Wall Street Transcripts, the name worked “because the domain name GoDaddy.com was available, but we also noticed that when people hear that name, two things happen. First, they smile. Second, they remember it.” After an unsuccessful attempt to establish the company as a source for website-building software, Parsons reinvented Go Daddy as a registrar of Internet domain names, buying unused website names and then reselling them to individuals and businesses in need of an online presence. Go Daddy also offered auxiliary services and products enabling customers to launch their sites after the domain-name purchase, including (as in the company's early days) software for building sites. Domain-name registration, however, was a burgeoning industry as America became increasingly wired and more and more businesses found it essential to establish a Web presence. By 2004 Go Daddy had sold nearly seven million domain names and was the world's leading registrar of domain names. Up to that point the company had done little marketing, relying primarily on word-of-mouth buzz and low prices; Go Daddy offered domain names for \$8.95, compared with fees of \$35 at the industry's high end.

In late 2004 Go Daddy enlisted New York agency the Ad Store for its first sustained offline advertising campaign. The company announced that the campaign would make its TV debut during the 2005 Super Bowl, a move that drew widespread criticism, partly because of the recent history of Super Bowl advertising undertaken by dot-com companies.

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In late 2004 Go Daddy enlisted New York agency the Ad Store for its first sustained offline advertising campaign. The company announced that the campaign would make its TV debut during the 2005 Super Bowl, a move that drew widespread criticism, partly because of the recent history of Super Bowl advertising undertaken by dot-com companies. Dot-com advertising on the Super Bowl had been prevalent in the late 1990s and in the first few years of the new century but had been nearly absent from the game since the bursting of the Internet bubble, leading many industry observers to connect such Super Bowl airtime purchases with the fiscal irresponsibility

characteristic of failed dot-coms. Parsons argued that his company was different. As he told Brandweek, “Back in ‘99 . . . dot-coms raised money on ideas that weren’t viable. But we are the leader in our industry and actually do make money.”

That Super Bowl, played on February 6, 2005, was the first since the infamous “wardrobe malfunction” that had resulted in pop singer Janet Jackson’s breast being exposed on the air during the previous year’s halftime show. Among the results of the public outcry following the incident was increased pressure on Super Bowl advertisers to avoid risky images and themes. Go Daddy chose to fly in the face of this pressure by running a sexually suggestive commercial that lampooned the prevailing climate of censorship. With a 30-second Super Bowl spot costing \$2.4 million, Go Daddy’s decision to advertise twice during the game represented a considerable risk for such an unknown company. Additional production expenses approached \$1 million. The spot featured a buxom woman undergoing Congressional questioning in order to gain approval to appear in a commercial for GoDaddy.com. As the woman pointed to the GoDaddy.com logo on the front of her tight tank top, one of the shirt’s straps broke, a wardrobe malfunction that was met with camera flashes and shocked exclamations as the woman continued to explain what GoDaddy.com was. The commercial aired as planned during the first quarter of the Super Bowl, but then, apparently because of the protests of a National Football League executive, Fox neglected to run the spot during the second on-air slot that Go Daddy had purchased. The spot was rated one of the Super Bowl’s most memorable, but it was the controversy surrounding the network’s refusal to air it a second time that proved to be Go Daddy’s true marketing coup. The numerous media stories about Fox’s censorship of a commercial about censorship gave Go Daddy nearly \$12 million in free publicity. The company continued to run TV spots featuring the tank-top-clad woman, including a spot during Super Bowl XL that made reference to the previous year’s commercial.

Target Audience

Parsons told Brandweek that Go Daddy targeted “everyone who wants a Web presence.” Go Daddy’s domain-name prices were among the industry’s least expensive, and it offered a range of website-management services that comparably priced competitors did not; therefore, Parsons and his colleagues believed that the company would continue to grow rapidly as long as it could make a wider public aware of its brand. The Super Bowl, of course, offered one of the last giant television audiences in an age of fragmenting viewership, and it was annually the most watched television program in America by a wide margin. Super Bowl XXXIX was expected to reach 130 million U.S. viewers, though the actual number of viewers watching the game at any given time was estimated at closer to 90 million.

If Go Daddy could make a splash with an audience of this size, it could count on a much greater degree of brand awareness among the American population at large. Though that year’s restrictions on the content of Super Bowl commercials limited the degree to which advertisers could use provocative imagery and messages, Go Daddy and the Ad Store nevertheless charted an intentionally controversial course as a means of standing out from the field of high-profile advertisers. The Go Daddy commercial thus featured an attractive female model in sexually suggestive attire and in a context that directly parodied the political hysteria surrounding the previous year’s halftime incident.

Campaign Strategy

The official price for 30 seconds of Super Bowl XXXIX airtime was \$2.4 million, and Go Daddy bought two such blocks of time, intending to run the same commercial twice, once in the first quarter of the game and once just before the two-minute warning at the game's end. (Media-industry insiders contended, however, that publicized Super Bowl advertising rates were akin to sticker prices on automobiles and that advertisers ultimately did not pay the full amount.) Go Daddy's expenses were not limited to the media-buying cost; the company invested close to \$1 million in production of its Super Bowl commercial, an amount of money equivalent to the yearly marketing budget of comparably sized companies. Part of this expense was a result of unforeseen problems with Fox in the weeks leading up to the game. As Tim Arnold, managing partner at the Ad Store, recounted after the fact in *Adweek*, Fox approved storyboards of the Go Daddy commercial on December 3, 2004 (just over two months prior to the Super Bowl, which was played on February 6, 2005), only to withdraw that approval on December 22, after the commercial was already in preproduction. After Fox placed new restrictions on the commercial—including a demand that the words “wardrobe malfunction” be removed from the script—the Ad Store shot “16 and a half” versions of the spot to account for all possible objections the network might yet make. The network continued to reject proposed versions of the commercial until the week before the game, at which point Go Daddy finally received grudging permission to use the airtime for which it had already paid in excess of \$4 million.

The commercial reproduced the look of the C-SPAN network (known for its live coverage of Congressional matters), with a banner at the bottom of the screen informing viewers that they were witnessing “Broadcast Censorship Hearings” in Salem, Massachusetts. A woman named Nikki Cappelli (played by Candice Michelle), wearing a tight-fitting tank top and jeans in an otherwise formally dressed crowd, explained to the Congressional committee that she wanted to be in a commercial. When asked what she was advertising, she stood and pointed to the chest of her tank top, on which the GoDaddy.com name was printed, and as she began to inform the panelists about the company's identity, a strap on her top snapped, threatening to reveal her breasts and triggering a flurry of camera flashes and gasps from onlookers. Asked what she would do in the commercial, Cappelli stood and performed a dance with her arms in the air, again triggering shocked gasps and camera flashes. A Congressional panelist then said, “Surely by now you must realize that you're upsetting the committee.” Cappelli earnestly replied, “I'm sorry, I didn't mean to upset the committee,” as an elderly committee member was shown putting an oxygen mask to his face. A black screen featuring the message “See more coverage at GoDaddy.com” then appeared—a reference to an uncensored and more sexually suggestive version of the “hearings” that was available for viewing on the website—and the commercial closed with the voice of a female committee member saying, “May I suggest a turtleneck?” The commercial never made its second appearance on the Super Bowl. After airing it in its assigned firstquarter spot, Fox decided not to run it in the fourth quarter, reportedly because of complaints made by a high-level National Football League executive.

Competition

Among Go Daddy's top competitors was Network Solutions, which was introduced as a technology consulting company in 1979, making it a veritable ancient in the online world. Network Solutions was awarded a grant from the National Science Foundation in 1993 to create a single domain-name registration service for the Internet, which effectively gave the company a monopoly in the industry of domain-name registration until 1999, when the field was opened to competition. The Internet-security and telecommunications company VeriSign acquired Network Solutions at the height of the dot-com bubble in 2000, for \$15 billion (the largest Internet merger in history at that point). The company's 2003 sale to Pivotal Equity was a measure of the changes in the dot-com world in the interim: the purchase price this time was \$100 million.

Register.com was another of Go Daddy's rival domain-name registrars. The company was founded as a domain-name registrar in 1994, and it was one of the five original companies selected for entry into the newly opened market in 1999. Like Network Solutions, Register.com had Internet-bubble baggage. The company made its initial public offering on March 3, 2000, a week before the Nasdaq peaked, at a price of \$24 per share; by the end of that first trading day, Register.com was priced at \$57.25 per share. Register.com shares climbed to \$116 before the dot-com bubble definitively burst. By 2005 the company's shares were hovering between \$5 and \$6 and were considered by many analysts to be a good value for the money.

Campaign Outcome

During the Super Bowl traffic to GoDaddy.com spiked by 378 percent, and a survey conducted one and then two days after the Super Bowl found that the Go Daddy commercial was the most memorable of all spots that ran during the game. It was the story of Fox's decision not to air the commercial a second time, however, that proved most useful to the company. The censorship of a commercial that itself poked fun at overzealous censorship proved irresistible to the media, especially in the context of the ongoing commentary about standards of broadcast decency. As word of this incident spread, Go Daddy became by far the most talked-about Super Bowl advertiser. The buzz surrounding the brand in the game's aftermath—measured as “share of voice,” the percentage of times that Go Daddy was mentioned in stories about the Super Bowl that ran on national, cable, and the top 50 local TV networks—was calculated at 51.4 percent between February 7 and 11, 2005. Go Daddy received nearly \$12 million in free publicity, and many of the TV stories about the incident replayed portions of the commercial. Bob Parsons said in a press release, “Go Daddy accomplished exactly what it set out to achieve with its first-ever Super Bowl ad—increased brand awareness. Today, millions of people now know about GoDaddy.com, which in turn has generated significant new business.” The magazine *Business 2.0* declared the Go Daddy Super Bowl effort the “Smartest Ad Campaign” of 2005.

Though Go Daddy allowed its contract with the Ad Store to expire soon after the 2005 Super Bowl, moving its creative duties in-house, the company's subsequent advertising conformed closely to the model established by the Super Bowl commercial. The actress who played Nikki

Cappelli, Candice Michelle, continued to appear in Go Daddy spots that drew overt attention to her sexual appeal, and she became known as the “Go Daddy Girl.” In 2006 she appeared in a Go Daddy spot that ran during the NFL Playoffs, and Go Daddy again struggled to get a spot approved for the Super Bowl. The Super Bowl XL commercial, which rehashed material from the previous year’s spot, again ran in an extended form on the company website, as did alternate versions of other Go Daddy commercials. Website visitors could read a detailed history of Go Daddy’s attempt to gain approval for its 2006 Super Bowl entry and could also view numerous spots that had been denied, suggesting that the company’s battles against censorship had become increasingly self-conscious and premeditated. Go Daddy continued to grow rapidly.

2. Case Study: Dove’s Campaign for Real Beauty

BY ABEY FRANCIS MANAGEMENT CASE STUDIES

Unilever’s Dove brand was launched in the market as a cleansing bar soap in 1957. The soap was based on a non-irritating cleaner and moisturizing component. By the 1970s, Unilever had enhanced the soap into a beauty bar, which was milder and promised women of moisturized skins. The popularity of the soap at this time soared, and Unilever started expansion into the global market and by 1996, the brand was selling in over 80 countries. Between 1995 and 2001, Unilever expanded the range of products under the Dove brand to include moisturizers, face creams, deodorants, shower gel, shampoos, conditioners, among other wide range of beauty and care products.

The key features and attributes of the brand such as its soft colors focused on promoting it as a rejuvenating, calming and exfoliating product brand with milder effects on the skin and high performance moisturizing abilities for dry skins. As the Dove brand mainly targeted women, its Dove logo and tagline represent gentleness and softness at a higher sophistication in performance.

The Campaign’s Inspiration

In 2004, the Dove Brand commissioned a report “The Real Truth About Beauty: A Global Report – Findings of the Global Study on Women, Beauty and Well-Being.” It is rooted in the increasing concern that representations of female beauty in popular culture fed a definition of beauty that was both inauthentic and unattainable. The Dove Brand theorized, resultantly that women are in this way prevented from appreciating beauty in themselves. Furthermore, in a culture where women are so highly valued on their physical appearance, these standards have the potential to negatively impact women’s self-esteem, happiness, and overall well-being.

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The key features and attributes of the brand such as its soft colors focused on promoting it as a rejuvenating, calming and exfoliating product brand with milder effects on the skin and high performance moisturizing abilities for dry skins. As the Dove brand mainly targeted women, its dove logo and tagline represent gentleness and softness at a higher sophistication in performance.

The Campaign's Inspiration

In 2004, the Dove Brand commissioned a report "The Real Truth About Beauty: A Global Report – Findings of the Global Study on Women, Beauty and Well-Being." It is rooted in the increasing concern that representations of female beauty in popular culture fed a definition of beauty that was both inauthentic and unattainable. The Dove Brand theorized, resultantly that women are in this way prevented from appreciating beauty in themselves. Furthermore, in a culture women are so highly valued on their physical appearance, these standards have the potential to negatively impact women's self-esteem, happiness, and overall well-being. Dove commissioned researchers from Harvard University, the London School of Economics, and StrategyOne to examine the relationship women have with beauty, determine how women define beauty, learn the level of satisfaction with women's beauty and the impact beauty has on the well-being of women.

The findings were based on interviews with 3,200 women between the ages of 18-64 and were largely disheartening. World-wide, only 12% of women are satisfied with their physical appearance. No women described themselves as "gorgeous," 1% of women described themselves as "stunning" and 2% of women describe themselves as "beautiful." However there was a marked demand for broader, more inclusive definition of beauty: 68% strongly agree that the media sets and unrealistic standard of beauty and 75% wish the media did a better job of representing the broad range of women's physical attractiveness, including size and shape and age. Furthermore, components of true beauty extend beyond mere physical attractiveness, to happiness, kindness, wisdom, dignity, love, authenticity and self-realization.

With this in mind the management team at Dove saw a great opportunity. At the time they were just introducing their line of beauty products.

Real Beauty Campaign

The campaign developed by Ogilvy and Mather, focused on interacting with the consumers, with Dove branding itself not only as a beauty brand but also one that cares about and reaches out consumer's needs. Adopting a reality based campaign using everyday girls in their advertisements; Dove not only enhanced self confidence, but also showed that Dove provides effective, accessible and affordable products that real women can confidently use to care for their skins. Philippe Harousseau, dove's marketing manager noted that the Dove campaign sought to

challenge the stereotypical beauty of young, tall and blond, and rather change the way beauty is perceived by emphasizing the beauty of each woman.

In 2004, Dove launched the first phase of its campaign to combat the problems revealed in their global study. They rolled-out a series of advertisements featuring women whose appearances are outside of the stereotypical norms of beauty. The Dove campaign recruited women recruited off the streets (at coffee shops, bookstores, grocery stores, etc.) instead of professional models. The women in the print ads are between the ages of 22 and 96 and a range across a variety of sizes (from 6 to 12). The images were shot by in-demand fashion photographer David Rankin. Dove guarantees the images in the campaign have not been airbrushed in any way. The advertisements were placed on billboards and bus stops throughout New York, Chicago, DC, LA and other top urban markets and asked viewers to go online to cast their vote: whether the models were “Fat or fab?”, “Wrinkled or wonderful?”, “Grey or gorgeous?” and “Freckled or flawless?”

Dove's Campaign for Real Beauty

The second phase of the campaign, launched in 2005, was the most iconic and featured six women with “real bodies and real curves.” This phase’s mission was to directly challenge the stereotypical assumption that only thin is beautiful. The ads promoted Dove’s firming lotion.

In response to the news and media outcry that erupted after Spain banned overly-skinny models from runways in 2006, Dove expanded on this phase of the campaign with three notable video ads: Evolution, Onslaught, and Amy. Each one of these videos tells a little bit about their campaign.

Evolution is a video about the beauty industry’s efforts to change women’s appearances into something completely different in the pursuit of publication. The video starts with a woman walking in the frame and sitting on a stool. A man can be heard shouting directions to some crew. The screen fades to black and then words appear on screen. “a Dove film” followed later by “evolution.” As the woman comes back onto screen, lights begin to turn on and people start to surround her, doing her hair and make-up. As music swells the viewer, the artists transform an average-looking blonde woman into a creation filled with make-up and hairspray. The video is on time-lapse, so what likely took over an hour to complete takes mere seconds to watch. After the transformation, the woman models for a photographer, as noted by the flashing lights. A photo is selected and then placed into photo editing software. Her neck is elongated, her hair expanded, her eyes enlarged along with a myriad of other small details to alter the image. The camera starts to zoom out and the viewer can see that the image is now on billboard overlooking a busy street. Then “No wonder our perception of beauty is distorted” appears on screen. The video ends with the Dove self-esteem fund logo. This video serves as a way to inform viewers about the Dove fund and to speak out against the rampant use cosmetics and technology in order to alter women to appear as something they are not. They took a woman and made her into something that she could never be, with features not physically possible, but in a packaged way that made her seem normal nonetheless.

Onslaught is similar to Evolution in that it also targets the beauty industry and how they make an attempt to change women or tell them to change. Onslaught also starts with a black screen and then the “a Dove film” and “Onslaught” appear on screen. A young redheaded girl appears on screen. Cheery music starts in the background, but transitions to more of rock music with the words “here it comes” repeated five times each time heightening the anticipation of the viewer. The final repetition is joined with the little girl disappearing and images of ads with small women taking her place. The ads are shown for less than a second each, not enough time to actually see what they are advertising but enough time to notice the often scantily clad women. The body part in the clips vary between buttocks, legs, chests, lips, and every other imaginable body part. The video pauses at what can be assumed as a music video with two women in bathing suits gyrating. The video returns to clips with ads for things to alter appearance. Key words can now be made out and strung together they say, “You’ll look younger, smaller, lighter, firmer, tighter, thinner, softer.” As the barrage continues, the ads show a woman on a scale. Her body gets smaller then larger and then smaller again in alternating clips spread through ones for losing weight. Then montage of plastic surgery—everything from breast augmentations to rhinoplasties. The ad then flashes to a few young girls walking across the street. “talk to your daughter before the beauty industry does” appears on screen right as the young redhead crosses the street looking at the audience. The ad finishes with the Dove fund logo. The name of the video is quiet telling about what Dove is trying to say. The little girl is meant to be a symbol of innocence and purity, she has not be affected by outside influences, yet. She soon will be noticing images everywhere, an onslaught in fact, that will be influencing her perception of the ideal body. Dove is urging parents, mothers specifically, to warn their daughters about how companies advertise and to have them get their confidence from internal sources rather than external ones.

Amy again starts in a similar fashion to the other two videos. The video shows a young boy, roughly 12 in age riding his bike to a house. He sits outside saying, “Amy” repeatedly. He looks disappointed that she is not appearing. After it is clear that he has been waiting a while, “Amy can name 12 things wrong with her appearance.” Preceded by a pause, “He can’t name one” then flashes followed by “Sent to you by someone who thinks you’re beautiful” and the Dove fund logo. Amy is supposed to be a young girl who has been affected by the beauty industry. She is self-conscious and is likely seeing problems that others don’t actually see.

The Campaign’s Effect

The campaign received free advertising space from media coverage on national television shows that reached 30 million viewers. The Oprah Winfrey Show aired the campaign daily for a week straight. The Ellen DeGeneres Show, The Today Show, The View and CNN also featured the campaign. Over the following year, profits from these advertisements increased dramatically and the campaign returned \$3 for every \$1 spent which is encouraging because it suggests that making profits and promoting ideas of positive beauty aren’t mutually-exclusive goals. In her book, *Enlightened Sexism*, Susan Douglas writes that the year that Dove started the Campaign for Real Beauty, their sales rose 12.5% and 10% the year after, hardly something to ignore. Clearly women were responding to their ad campaign. Women flocked to the company that were putting real women in their ads.

This campaign was powerfully moving for many women who were extremely relieved to see everyday diversity of feminine beauty celebrated by a prominent beauty company. Stacy Nadeau (one of the six Dove Beauties, now a public speaker and promoter of self-esteem in young girls) gave a lecture at Colgate in 2010 during which she told a story about a public appearance the six of them made shortly after the unveiling of the 2nd phase. One middle-aged woman approached the group, crying and holding a Dove advertisement and a picture of her daughter, who was recovering from anorexia. She said her daughter's prognosis was extremely dire until the launch of this advertisement campaign at which point these photos became an inspiration for her daughter. In an emotional moment for all, still openly crying she thanked the women for saving her daughter's life.

As a whole, Dove's campaign for real beauty was a pioneering attempt to challenge the conceptions of beauty that are so limiting and harmful to women.

Campaign Critiques

In a world that is inundated with images that give women a narrow view of what the ideal body, the Dove's Campaign for Real Beauty is a refreshing change. It opens up the conversation about how young women are influenced by the media and how the media can distort images to give unrealistic expectations. However, the Dove campaign also falls victims to some of the old tricks such as consumerism and sexualization as means to empower women. Critics voiced concerns about the authenticity of the brand's movement, their parent company's questionable associations, and the actual product the ads are selling.

As previously mentioned, the campaign generated double-digit growth for Dove in the second quarter of 2005. As evident in Dove's case study, which is very blatantly focused on the economic advantages of this campaign, women influence or buy 80% of products sold, thus marketing to women is crucial for Dove's success. Author Jonah Bloom remarked, " You think Dove hatched 'Campaign for Real Beauty' because it cares about women's self-esteem? No, it simply wanted to play to the pack-following newsrooms all over the country that it knew would give the campaign more media coverage than it could have bought with a decade's worth of marketing."

But, by going and buying these products, women were, and still are, falling victim to consumerism. Dove's campaign is giving women a means to overcome the stick figure expectation. But, they must purchase their products to do so. In order to break free of the pressure from some companies, they buy products from another. Assumed power and control is only given through consumerism.

The Dove Brand's parent company is Unilever which owns many off-shoot brands including AXE, Slimfast, and Fair and Lovely. AXE commercials depend heavily on sexist stereotypes and overtly sexualized women to sell their product. Slimfast is clearly in direct contradiction of the message of Dove campaign as it's products perpetuate the same body-insecurity problems Dove's is trying to fight. Fair and Lovely is a skin-lightening product that is marketed to dark-

skinned women across the world. This product reinforces the stereotype that light skin and beauty are somehow related. While the creators of Dove's campaign for real beauty may not be in the position to directly influence the actions of these other products, the mere association is enough to slightly tarnish the image of the campaign.

Another issue with the Dove's campaign for real beauty is the sexualization of women. The most well known ad for the company is a series of "real" women clad only in white underwear posing for a camera. They are heralded as a change in times. In order to show that the women are comfortable in their own skin, they are showing nearly all of it. In most cases, ads targeted towards women do not have scantily clad women in them. Those are typically for men. Many of Dove's products are for smoother or softer skin, which is easily shown with the half-naked women. White is generally associated with purity and cleanliness. By having white undergarments for the women to model, they are being given and underlying nature of cleanliness and purity. In this case, the purity can come across as sexual purity. Since it is an ad about women celebrating their bodies, of course it is not about sex. In fact, it is the opposite. Because of the nature of the ad, the marketers were able to be more sexual without off-putting their female consumers who would normally oppose such a move. The ads are telling women that they can be empowered by being sexual, i.e. by still being attractive in their underwear. The ads from Dove still fall victim to sexualization.

3. Case Study: Intel's Social Media Strategy

BY **ABEY FRANCIS** MANAGEMENT CASE STUDIES



Intel is one of the most foremost American global technology companies and the world's largest semiconductor chip producer, in term of revenue. It is the inventor of the x86 series of microprocessors where its processors nowadays can be seen in a various computing devices used. The company was founded in 1968, as Integrated Electronics Corporation with home-based in Santa Clara, California, USA. Intel also manufactures motherboard chipsets, integrated circuits, graphic chips, network interface controllers, and other communications and computing utility devices. Robert Noyce and Gordon Moore and widely cooperated with the executive leadership Andrew Grove initially founded the company. The company grew and later started

integrating an advanced chip design with a leading capability support manufacturing. The company started its prominent advertising campaign with Intel's "Intel Inside" in the 1990s and made its Pentium brand names as the home-used processor.

The company is everywhere in the digital social media – blogs, Facebook, Twitter, YouTube, Instagram, Google+, LinkedIn, etc. Intel Free Press is a tech news site from Intel Corporation, covering technology and innovation stories focused on people, technology, events and topics relevant to Intel and the computing industry. Intel's chosen social media weapon is high-quality content, and its delivery vehicle is its staff. Intel realized that engaged end-users, particularly influential bloggers and hobbyists, rely heavily on technical resources and product information that is not widely available from resellers; consequently, it launched social media campaigns based on promoting subject-matter experts and internal brand advocates.

Under Intel's global social media strategist, Ekaterina Walter leadership, Intel has seen a good 10% to 12% monthly fan base growth

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Intel Social Media Strategy

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Under Intel's global social media strategist, Ekaterina Walter leadership, Intel has seen a good 10% to 12% monthly fan base growth.

The way consumers communicate with each other and with brands fundamentally changed. We didn't have a choice. Traffic to Fortune 100 company websites decreased significantly while engagement on social networks with brands increased. More and more there is an expectation among consumers that brands need to listen, be responsive and know where key conversations happen. And if brands don't, the perception is that they don't care. The price of inactivity was greater than the risk we could have encountered. – Ekaterina Walter.

Her principles for Facebook engagement include original content, not just automated, and original videos, not just YouTube links.

Content is king. This hasn't changed. Relevant content should be at the core of brand's strategy. Creating relevant content is an amazing way to add value and strengthen those relationships you build through your online conversations. Your customers love to be in the know and this is a great way to position yourself as an industry expert. You want to become a trusted source in the community and sharing sought-out content is the only way to become one. You should then use your social channels to distribute that content across the web and use content as a catalyst for conversations.- Ekaterina Walter.

Intel conducted a study benchmarking the Facebook engagement rates of other brands similar to Intel in size and standing. They found—much to their delight—that Intel came out on top with higher levels of engagement than any of the other brands. Intel also discovered that organic engagement (vs. paid) had steadily increased over time, confirming the right content is hitting the right audience. In August 2012, Intel's campaign "How computers were made" post on Facebook attracted 102,5K+ likes in a week since it was published on August 9. More than 34,069 people have chosen to share the link, while 3,258 commented on it. 80%, of the conversations around Intel and products happen on blogs and twitter. Facebook usage within the business has also increased with 250 individually created and managed pages which was becoming difficult to co-ordinate and manage multi market campaigns. After reviewing 250 Facebook pages and 250 Twitter handles/account presence, Intel took the decision to alter their social media strategy from being decentralized to a centralized global strategy supported by internal guidelines, training programs, content editorial, publishing schedules, supplemented by a suite of publishing Vitruve, listening, Radian6, & internal reporting tools. This centralized strategy allows them to listen and respond globally, locally or to individuals, based on the context of the conversation.

Intel's marketing is not just about hardware, chips and engineering—"experience" is the new focus. "People don't buy processors...they buy experiences," said David Veneski U.S. Media Director, at Intel Corporation. "You need to turn a moment into a momentum, and a momentum into a movement," Veneski said. Projects like Intel's Museum of Me use social media to encourage users to create a "visual archive of their social life." Another campaign, "Intel Ultrabook Temptations" is a collaborative social experiment to assess how desperate people will be to get their hands on the product. In this experiment users are encouraged to jump around on a custom-built measurement device to generate their "excitement" rating and the event is captured on video and shared socially as the feature on Intel's YouTube page.

"The focus has shifted from being iconic to posting a status update," said Veneski which makes Intel more humanized and relatable to the consumer. Intel is embracing social media and using it as a key element to understand the driving factors behind day-to-day experiences. Intel's products are at the core of technologies that people use, and users like to capture those experiences, talk about them, and share them with friends, families and others. Through blogs, video, and social networks like Twitter, Intel is actively onboarding new customers' faster and strengthening relationships with existing customers. Like most companies, the online community was initially built by marketing. "It is integrated into our marketing plan," explains Laurie Buczek, who heads enterprise marketing for Intel's Storage Group and works closely with the leaders of Intel's 3,000 to 4,000 salespeople. Intel also uses YouTube, which enables product

managers to vividly demonstrate new technologies and Twitter (@Intel). Intel's Social Media Center of Excellence sets the strategy and guidelines for all social media content across the company's far-reaching locations and business units.

Planet Blue Internal Social Network for Employees

Intel has an internal social media platform called Planet Blue that was launched in 2009, which is company controlled Facebook styled intranet, where more than 1,00,000 employees can connect with each other, collaborate and share knowledge. Planet blue includes blogs, wikis, status updates, discussion forums and employees can also form groups based on their interests, hobbies, etc. Employees not only communicate and create groups but also use the platform to ideate and innovate which is essential for Intel as there is constant pressure on the company to develop new products. Intel earlier had a wiki based platform for collaboration, called Intelpedia, "the Intel encyclopedia that anyone can edit," was launched in 2006, which employees can edit freely and had millions of pages and thousands of contributors. Intel had a culture of technology-based information-sharing since early 2003, when employee blogging started predominantly included self-maintained servers under desks and these internal employee blogs gained popularity. Intel CEO Paul Otellini launched his employee blog in 2004 and other top execs and leaders followed throughout 2005 culminating in a fully IT-supported platform that same year. Intel also started its popular developer blogs and wikis for software collaboration called Intel Software Network back in May 2006. In April 2007, Intel created Blogs@Intel as a new business tool for customers and employees to directly communicate and collaborate. In June 2008, Intel added the Digital IQ training program for employees that contained around 60 programs online with certification on how to use these social media tools to increase innovation, communication and collaboration at work.

According to a post titled "How successful is your Enterprise 2.0 strategy?" on Intel communities, "some of the metrics Intel track are related to adoption – such as active users (creators, synthesizers, consumers) and "unique visitors". However, these indicators may not accurately represent the success indicators of the platform. Quality of discussions, impact of these discussions on the users, problem resolutions, agility in solving issues, ability to find subject matters experts quickly could be different parameters which can really show how successful the platform is." This highlights that Intel closely monitors its social media styled intranet and hopes that the intranet will fuel social learning among employees and also use it for their career development where they can look for positions and chat about their career progression. Intel created a comprehensive set of social media policies called the Intel Social Media Guidelines that are available in over 35 languages designed to help employees to understand how to manage their social media presence. Intel also created Social Media Center of Excellence, which is a cross functional body of experts from Marketing, PR, legal and Digital Communications, who collaborated to create guidelines, processes, strategies, and skill-building courses for how Intel employees can use social media tools like blogs, wikis, Twitter, Facebook, and social networks around the world. Intel is further looking to improve its Planet Blue and is looking to add voice control features to the content so that employees can use it effectively for their collaboration, communication, learning and knowledge sharing initiatives.

4. Case Study: Marketing Strategies of IBM

BY ABEY FRANCIS MANAGEMENT CASE STUDIES



International Business Machines Corporation, better known as IBM, is a multinational IT company involved in the manufacture and retail of computer hardware and software applications, and IT consulting services. The company has established itself as one of the selected information technology companies since 19th century. Adoption of marketing strategies for IBM has been a planned structure since 19th century and by means of these strategies it has earned enough success all over the world. With its growth in the manufacturing as well as marketing domains of computer hardware and software, it has gained the nickname of “Big Blue”. On marketing grounds, IBM follows strict infrastructural services, added by hosting provisions and consulting services in various areas from mainframe computers to the persuasion of nanotechnology.

Well – devised and efficient marketing strategies have been the key to IBM’ global success. The company strongly believes that devising effective marketing strategies requires making appropriate decisions that can well enhance all kinds of competitive advantages and can create all kinds of new sources of value for the purpose of improving the organisational revenue growth. According to Luq Niazi, Leader of Strategy and Change at IBM, “when the leaders of an organisation think about their business as components, it becomes clear which ones they need to own – and which they do not”. This clearly indicates the great emphasis that IBM places on the performance and decision making capabilities of leaders in devising effective marketing strategies. In addition, the firm also considers understanding the requirements and needs of customers as crucial for developing effective marketing strategies

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Based on IBM’ market share and dominance in the IT industry, the firm can be aptly described as a ‘market leader’. Being a market leader, an important marketing strategy which IBM uses against its competitors is the defensive marketing warfare strategy. The defensive marketing strategy involves the firm employing tactics to maintain its market share. There are several tactics that firms use for defending their market share, such as fortification, counterattack, mobile defence and strategic retreat. Being the courageous market leader that IBM is, the firm adopts the best defensive marketing strategy which is “self attack”. IBM’ strategy is “cheaper and better than IBM”. Aware of IBM’ tactic, customers wait for IBM’ new prospects as they know that the Big Blue will constantly introduce new and better products which makes the firm’ own products obsolete. Another key marketing strategy employed by IBM for sustaining its market leadership is product differentiation strategies. Product differentiation can be achieved using a variety of factors such as distinctive products, reliability, durability, product design etc. IBM uses a product differentiation strategy based on quality of performance. In line with its quest for further growth and market leadership, the firm adopts a diversification strategy. The importance of IBM’ growth strategy has heightened in the current economic situation with companies in the computer industry having faced a massive drop in the industrial production and productivity of computer hardware and the future growth for this segment also appearing dim. In such a context, IBM has strategically reduced its exposure to hardware by diversifying into software and services.

IBM also realises the importance of maintaining good relationships with its customers and in line the firm lays great emphasis on trust-based marketing strategies. Trust-based marketing strategies stress on the need for organisations to gain ethical hold over consumer dealings and also be honest and open about its products and the services. For IBM, adoption of this strategy has been very effective in developing its brand identity and image. In all of its marketing activities, the firm strives at building customer trust and loyalty.

Importance and Use of Information in IBM Marketing Strategy

The importance and use of information is vital for gaining success. In line, IBM adopted the strategy to take up Social Networking to the work place. It is an absolute means of sharing ideas, complains and letters of appreciation in public. By means of adopting networking opportunities, IBM established its strong hold over competitive market. It is through the provision of Social Networking (SN), that IBM established its commitment to technology and developed an

enterprise – wide SN mindset. IBM is the first major IT supplier that has got potential provisions for social networking and is in the process of changing the entire enterprise along with a credible application to address the market.

By means of investments made in the social networking domain, IBM has gained enough market strengths in the enterprise lineage, global services, deep pockets and above all in gaining loyal customers. By success of social networking, IBM proved to be a fine player in the domain of information networking. The proceedings have added many advantages to its organisational global services. Social networking for enterprises have been implemented with enough marketing strategies and this is what is providing IBM with technical expertise in the field of organizational/adoption issues. The launching of more facilities related to social networking are relevant to the competition of the market. The launcher came up with a new idea and launched it much before the thought had developed in anyone' mind. The second big thing to the adoption of marketing strategy is the IBM's mindset in the launching of Lotus Connection. It is an information networking process with collaboration-centric approach to social networking and helps in information sharing and uninterrupted workflow. By few minutes of exploration anybody can well get hold over its functionalities. IBM kept it easy and user friendly; the basics of marketing strategies.

When it comes to the use of information system in IBM, the adoption of unique kind of marketing strategies is predominant. The basic approach is in being innovative and adopting something that is very user friendly and easy for the customer to adopt. Complicacies in the same field can lead to failure of the same. This is the reason that IBM lays emphasis over making it simple, easy and sharing more than the consumer can expect. Once there is a kind of trust and sense of being facilitated gets into the consumer, he hardly will opt for any other company and this is what IBM believes to the core. Application of innovative ideas in the field of information sharing units can be of great risk, but under the marketing strategy of IBM, this risk has been taken again and again with enough success.

Global Context in IBM Marketing Planning

In the global context, IBM has proved itself as a strong contender by managing to sustain in the most difficult situations. It has overcome the twists and turns it initially faced in adjusting to the 'bricks-and-clicks' business structure. Overcoming all the hurdles IBM is now achieving milestones through the advantages forwarded by brick-and-click enterprises. It is through this enterprise structure that IBM has transformed into a major player in terms of getting hold over global marketing plans. Its formulations are inclusive of creating a global brand blueprint. It is a mode that usually gets expressed locally and after attaining some success approaches on global grounds. IBM always follows the process of establishing central framework and then architects the relevant consumer experiences to gain consistency with the brand.

IBM always concentrates in gaining single view from its consumers and that helps in assessing the risk factors of global marketing strategies. In order to meet the diversified point of views, IBM follows the structure noted below;

Process of analysing the context of 'when', 'where' and 'how' the appropriate and relevant customer data can be collected. This is an approach that is done under the provision of practical market survey.

The means to create absolute governance framework with special attentions led over management policies and overall practices. These are the sources that are collected through the purpose of encouraging customer centricity added by the scope to safeguard customer privacy.

Approaches led by institute consistent processes for target customer is the next step. In this process the relationship led by the management across all the domains of sales and provided services of the organisation are scrutinized professionally.

The process of appointing efficient team leaders and strong management initiators. IBM also appoints a leader who can perform as a single customer advocate and is very much accountable for all the sorted touch points.

The marketing strategies adopted by IBM to meet global demands and competitions are well inclusive of a robust infrastructure. It has the provision for optimising flexibility and a hub-and-spoke architecture for collecting consumer demands on global arena. There is also well marked acknowledgement for all the innovative ways adopted by the partners of IBM. Developments attain by the partners of IBM in global terms is also directly related to the marketing strategies followed by IBM. IBM understands the fact that partners can add much hold over the local market and can reach the consumer with more in-depth formulations. This is the reason that they believe in developing capitalized relationship with these partners for future opportunities.

IBM and E-Business Strategies

The motive of any electronic business is to efficiently meet consumer demands through internet networking. The internet provides a medium for businesses to reach out to customers globally at very low costs. It is an exclusive means adopted through the dealings related to information and communication technologies. In case of IBM the role of e-business is very strong. Through e-business strategies, IBM is equipping itself with all kinds of external activities and is applying determined relationships for respective business dealings; with individuals, diversified groups and corporate clients. According to 'Who Says Elephants Can't Dance?'; a book by a former CEO of IBM, Louis Gerstner (2003), IBM' approach for e-Business strategies is handled by specialized e – business teams operating under IBM's marketing department.

It is through its e-business strategies that IBM is able to link its internal as well as external data processing systems with greater efficiency and flexibility. E-business helped IBM in reaching closer to its consumers, conveying the message of reliability and in urn enhancing customer

loyalty to the brand. The proceedings led by IBM for the development and implementation of e-business concentrate on the diversified functions occurring through electronic capabilities. IBM is also a part of the entire value chain proceeding for more profitable dominance over the local as well as global market. There are some predominant sectors where the e-business strategies are applied to gain more trust and money from the consumer. These activities are noted below;

electronic purchasing

supply chain management

processing orders electronically

handling customer service

cooperating with business partners

These proceedings add special technical standards in the e-business structure of IBM. The firm also utilises e-business strategies to exchange of data between its partners and associate companies. As a matter of fact the e-business strategies of IBM are not much different from the other marketing strategies. The basic difference however depends over the expansion of management for sending and receiving contracts from the consumer. It is under this strategic implementation that IBM has adopted many local dealers to be a part of its services. These dealers are of course selected through some professional modes. The reputations of these dealers are marked by IBM first before offering the partnership. In terms of services for each product sold through e-business, IBM provides appropriate training to all those people who are a part of this structure. With strategic planning IBM is also into the dealings related to integrated intra and inter firm business proceedings.

Conclusion

It can be well concluded that the marketing strategies adopted by IBM are very much structured on the basis of trust-based marketing strategies. It is through this theoretical approach that IBM has established itself very strongly, amidst burgeoning and very unpredictable online as well as global marketplace. IBM concentrates in providing its consumer every possible facility that he demands and that too with very balanced services. It is more about having the trust of every single consumer, rather than having lots of them without the trust. The products and services provided by IBM can guarantee their utility to the customer's satisfaction. In a nutshell, IBM has got professional and the courage to take a risk for innovative ideas. It explores the consumer's domain through proper hold over the local and global proceedings.

6. Case Study: Success of Amazon's Kindle Fire

BY ABEY FRANCIS MANAGEMENT CASE STUDIES

kindle fire



In 2007 Amazon introduced the first Kindle e-reader for \$359, their first foray into selling a tangible product under their own brand. The media quickly named the product an e-reader, a limited use mobile device designed for downloading and storing content from online. Perpetuating a successful, yet deceptively simple business model, the Kindle e-reader made “online [book] shopping so easy and convenient,” customers could browse, download and read books, magazines and newspaper content, at the click of a button on the Kindle. The e-reader market perked up as Amazon offered an affordable price point of \$9.99 for book downloads and blended it with an easy to read e-ink, glare free device along with a simple user interface and operating system. Kindle’s launch success became the catalyst that opened up the e-reader market for big box book retailers, Barnes and Noble and Borders bookstores who shortly followed with introductions of their own e-readers and content libraries. Barnes & Noble jumped into the market in 2010 with their product, the Nook. These e-readers had the ability to upload books, magazines and even some newspapers almost instantaneously, but they were not in fullcolor nor did they have email, video and word processing capabilities like tablets, such as the iPad, HP Touchpad and Samsung Galaxy. As more tablets came to market, some mused about whether Amazon, the successful e-tailer, could credibly compete in the tablet war. Jeff Bezos, Amazon’s founder and CEO seemed to think so. By early Fall 2011 Apple thought they had the tablet market all wrapped up for the upcoming holiday season with their popular iPad tablet posting record sales.

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whether Amazon, the successful e-tailer, could credibly compete in the tablet war. Jeff Bezos, Amazon's founder and CEO seemed to think so. By early Fall 2011 Apple thought they had the tablet market all wrapped up for the upcoming holiday season with their popular iPad tablet posting record sales. That was until Jeff Bezos, CEO of Amazon, the Internet retailer, surprised the mobile computing industry with his late September introduction of the Kindle Fire, a fully loaded "e-reader's tablet" for a mere \$199 compared to iPad's \$499. The leading e-tailer had unexpectedly introduced a new mobile device that promised to be the first credible threat to the leading iPad. That was, if Amazon could smartly position itself in the fast-changing tablet arena where iPad dominated.

amazon kindle fire success

Kindle Fire is a 7-inch multi-touch display with IPS technology, runs on Google's Android operating system and have access to the Amazon Appstore and digital content like streaming movies, TV shows, and e-books. Compared to the market leader Apple iPad, Kindle Fire is a sort of low end device as it lacks camera, GPS, storage capability, high end graphical display, powerful chip, etc. Amazon's marketing strategy is that it tries to define its own market by targeting the non-iPad users, users who cannot afford iPad, users looking for other Android based tablets and making the competition irrelevant by making the device as a media consumption device empowered by Amazon's media platform that has huge content like music, movies, videos, books, etc. Kindle Fire differentiates itself from iPad and other tablet devices by focusing not on high end features but with simple and focused features that offers its users a unique experience and affordability. Also Kindle Fire is light weight, durable, good battery life and easy to use.

Amazon.com offers Kindle Fire at a lower price as it eliminated many costly feature like the camera, 3G, GPS, Bluetooth, etc but it offered its customers other features like its own developed web browser Silk that serves the web pages quickly using the network speed and computing power of the Amazon Elastic Compute Cloud (Amazon EC2) and the datacenters that host Amazon EC2 are run by Amazon. Low storage is compensated as the users can store their data on the Amazon EC2 Cloud, and Amazon has huge content like books, music, movies, videos, TV Shows, etc that users can easily download and play it on the device. Kindle Fire is being sold by Amazon at close to its cost and at a slight loss but it is hoping to make money through selling the content that includes 19 million songs, books, movies, applications, etc. Since Kindle fire is closely tied to the Amazon Ecosystem like Amazon.com store, cloud, content and it will be hugely beneficial to the marketers and content providers to sell their offerings easily, target customers with specific offerings, to interact and understand the consumer behavior through this. Kindle Fire also helps in increasing its core business which is e-retailing as the device provides an easy access to the store where customers can buy and sell anything and everything.

Amazon also launched a free library of downloadable book titles and video movie streams through the site and local libraries for Amazon Prime subscribers. "Prime" members initially paid an annual subscription fee of \$89 to receive free shipping on all purchases through

Amazon's site and would now benefit with additional access to free downloadable content. This was Bezos way of rewarding customer loyalty and keep customers returning for any purchase.

According to IDC, Amazon sold about 4.7 million units of Kindle Fire during the fourth quarter of 2011 and the device was shipped to customers from November 15, 2011. The device has boosted Amazon revenues in the first quarter of 2012 and also helped the company to double its market share of the Android based tablets market and capture more than half of the US market for Android based tablets. Kindle Fire is equipped with Web surfing, e-reading and video streaming activities that most consumers want and Amazon hopes that the device sales will help to increase digital media sales to eventually contribute a larger percentage of revenues of Amazon total revenues and the device will also helps in connecting and transacting with consumers on various other fronts. According to a study conducted by RBC Capital analyst Ross Sandler of 216 Kindle Owners, Amazon can expect to make \$136 per Kindle through the life of the tablet and e-book sales will contribute most of the part. Study also found that 80% of Kindle Fire owners bought an e-book, and 58% bought three or more e-books and Sandler believes that the average Kindle Fire owner will spend \$15 per quarter on e-book. Over 60% of Kindle Fire owners bought an app, and almost 50% bought three or more and Sandler believes that Kindle Fire owners will spend \$9 per quarter on apps for the life of the device.

With the Kindle Fire closely linked to Amazon's online offerings of e-book store, movie and music service and a redesign of its shopping website to make it easier for mobile consumers, the Fire funneled users directly into Amazon's "meticulously constructed world of content, commerce and cloud computing." Kindle Fire has boosted Amazon revenues in first quarter 2012 and according to the company it remains the best selling, most gifted, and most wished for product on the site. Amazon also announced that in the first quarter 2012, 9 out of 10 of the top sellers on Amazon.com were digital products – Kindle, Kindle books, movies, music and apps and it highlight the importance of Kindle Fire, as it provides Amazon with a device to handle the shift from physical media products, like books, DVDs, video games and CDs, to digital versions of such content. The rise in North America sales of digital content where Kindle Fire is exclusively sold is another testimony of how Kindle Fire is going to drive sales of digital content and ultimately revenues in future. With such positive response Amazon is looking to add more digital content to its inventory and also looking to expand the sale of Kindle Fire in other countries. With more and more tablets being sold in future, Amazon can through its Kindle Fire and huge digital content inventory expects to increase the sales of both the device and content and significantly increase its revenues.

7. Case Study: L'Oreal International Marketing Strategy
BY ABEY FRANCIS MANAGEMENT CASE STUDIES

L'ORÉAL PARIS

L'oreal is the world's biggest cosmetics and beauty products company. Basically it's a French based company and its headquarterd in Paris. It is focusly engaged in the field of production and marketing of concentrating on hair colours, skin care, perfumes and fragrances, make up and styling products. L'oreal products also based on dermatological and pharmaceutical fields. Their products are made for Individual and professional customers. This company operates over 130 countries like Asia, America, East and West Europe through 25 international brands.

The success of L'Oreal lies in the fact that the company succeeded in reaching out to the customers of different countries of the world, across different income ranges and cultural patterns, giving them the appropriate product they are worthy of. The area of expertise of L'Oreal being that it succeeded almost in every country that it entered. The strategies of L'Oreal was varied enough to help it and stop itself from restricting itself in a single country. L'Oreal sold its product on the basis of customer demand and country want rather than keeping the product identical across the globe. It built ample number of brands or mammoth brands entrenched to the restricted culture and which appealed to a variety of segment of the universal market instead of generalising the brand and edible in innumerable culture. L'Oreal went on to being a local product in every international market. The brand extension of L'Oreal also came in the same sector or the same segment of market. L'Oreal believed in growing its expertise in the segment it is conscious of rather than going into a completely new sector of market.

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the same sector or the same segment of market. L'Oreal believed in growing its expertise in the segment it is conscious of rather than going into a completely new sector of market.

L'Oreal International Marketing Strategy

International marketing strategy is more in-depth and broadened in one sense of the term. It is simply a principle of marketing however on a global scale. Setup of global marketing strategy has a lot to do with understanding the nature of global market itself, and most importantly the environment. Business environment across the globe has different economic, social and political influence. Thus, it is believed that selecting a global market target for examples when strategizing is a good idea.

International marketing strategy of L'Oreal is concentrated on a cross cultural arena spanning four market destinations. They are namely, 1.) Asian Market, 2.) European Market, 3.) North America Market and 4.) The African, Orient and Pacific Region.

Marketing Strategy of L'Oreal in Asia

At present L'Oreal is one of the best company in the whole world in the field of cosmetic products. The cosmetic products of the L'Oreal are widely used and specially the hair colour which was introduced by L'Oreal few years ago. L'Oreal is very famous in Asia and their products in Asia are very cheaper than the other companies and are used by majority of people in china, Thailand, Japan etc. L'Oreal is famous and very successful because of their global marketing strategies which are very helpful and also distinct from the strategies used by other companies in this field. L'Oreal in Asia uses the sustainable strategy that is of growing the company as the demands of cosmetic products in the countries like china, Thailand etc is in great amount. This company uses the strategy of suspicious brand management and they also brought the strategy of more suspicious acquisitions. The main problem that a company like L'Oreal faces in Asia is of competition given by the other companies dealing with the cosmetic products. To overcome this problem in Asia these companies use the strategy of selling good quality products at the cheaper rates than the other companies. One of the best strategies of L'Oreal in Asia is of diversification of the brand and the main reason behind this strategy by L'Oreal is to make them palatable in the local cultures. L'Oreal in Asia aims at the management of the global brands with the local variations and this means that their main aim is of becoming a local and not the foreign company in Asia. For example L'Oreal in Thailand has given local names to their stores and most of the employees present in this company, are local people of Thailand. It is because of all these strategies, L'Oreal is very successful in whole Asia.

Marketing Strategy of L'Oreal in European Market

L'Oreal is the only company which uses the strategies which also supports the people in many ways and not only in providing good quality products at cheaper rates. L'Oreal used different strategies of marketing in the European market like they used the strategy of nurturing self-esteem of the people with beauty. In France, L'Oreal created the programs like "Beauty from the

heart” for helping the people made helpless by illness or any kind of negative life experiences. In the countries like UK and Germany, many of the women and also the young people regain their confidence and their self image gradually by using the cosmetics which are provided by L’Oreal. In European countries L’Oreal also used the marketing strategies like taking calculated amount of risk etc but most of the strategies are related to the growth of the people mentally and not only for the beauty or the fashion purpose. Various innovative treatment programs are launched by L’Oreal for the young people of European countries and this company also launches the free skincare and make-up workshops for the women suffering from cancer. For example in France a programme named as “La Vie, de Plus Belle” offers the free skincare and makeup for the cancer suffering women in all over the France. This helps them to cope with the treatment’s side effects and it also helps them to retain their self esteem which is very important for a patient. In the European countries L’Oreal generally uses the strategy of the management of brand by which L’Oreal had made a large amount of brands which are rooted in the local culture and which all appeals to the various segments of the global market. By using these social types of strategies for the people of Europe has helped L’Oreal in expanding their business in the whole Europe.

Marketing Strategy of L’Oreal in North American Market

North American markets are considered as a perfect place for the companies like L’Oreal, Olay, ponds etc. The best business of L’Oreal comes from the market of US. The reason for this much success is that L’Oreal uses very good global marketing strategies in North America and the other countries like Canada etc. One of the successful strategies of L’Oreal in US market is brand extensions which includes the extensions of the brands after doing a complete research. For example when L’Oreal launched a shampoo for kids they firstly made a complete research and also debated about the new launch or for an extension. In US and Canada L’Oreal uses the strategy of frequent advertisements and promotions. As we know in the present scenario proper advertisements and promotions are very important for any company because people follow the promotions and due to which the demands of the products like hair colour increases at a very rapid rate. We can clearly understand the advertisement and the promotions of L’Oreal through their media budget. L’Oreal has the twelfth largest media budget in the world which is much more than the other companies of this field. For example in the late 1990’s the expenditure of L’Oreal advertising and promotion was jumped from the 37% to around 47% of the total amount of sales. The global ad spending of L’Oreal was increased to \$1.25 billion which was on par with the company named as coca cola. The best thing about this company is that they have a separate and very distinct policy of promotion in the market of US. Matrix is the number one brand of L’Oreal in US and the main reason behind the success of matrix is the frequent and distinct advertisement and promotion of the cosmetic and the hair products. The people of countries like Canada like to use new products that mean they like changes in their product after some interval of time. So by keeping this thing in mind L’Oreal uses the strategies of modifications which mean they modify their existing products according to the latest tastes and fashion of the local people. According to latest surveys of the people of L’Oreal company, majority of the profits of this company is because of US and these perfect strategies used by this company in US is the reason behind this type of success specially in north American market. (Helping vulnerable people)

Marketing Strategy of L’Oreal in Africa, Orient and Pacific Region

Like other countries in the world L'Oreal is also very successful and equally famous in Africa and Pacific region. L'Oreal entered into the market of India in the year 1997 and at that time there was not much awareness about the structure in the industry of hairdressing. In the countries like UAE and Australia, proper and organized education was totally absent and perfect and well-trained hairdressers were also not present at that time. Despite of all these problems L'Oreal in India made some of the strategies and one of the best strategies of L'Oreal is that they launched various technical training centers and they even opened a club of only the hairdressers. In UAE, L'Oreal products which were professional began selling through Parisienne salons while the other companies have begun retailing their range of hair color to power growth. L'Oreal uses a global marketing strategy of launching its successful brands all around the world. For example in February of this year only, L'Oreal made an announcement of the arrival of the matrix which is the number one brand of L'Oreal in US to India, UAE etc with a reason of adding range of hair products to their existing products at affordable prices. The main thing about this company is that they make strategies according to the local culture of different countries and not uses the same strategies in every country. Because of all these strategies, L'Oreal gains a huge profit from Europe every year.

8. Case Study of Johnson & Johnson: Creating the Right Fit between Corporate Communication and Organizational Culture

BY ABEY FRANCIS MANAGEMENT CASE STUDIES



Early in Bill Nielsen's tenure as the director of corporate communication for Johnson & Johnson, Ralph S. Larsen, the CEO to whom he reported, told him, "I believe in sunlight about everything." Larsen wanted to know the truth about company activities, whether good or bad, in an open way and without embellishment, and offered his assistance to Nielsen. From the start, then, Nielsen knew that the CEO would support him as long as he, Nielsen, was honest and direct.

New to the company in the late 1980s, Nielsen soon discovered that none of the benchmarking studies about corporate communication could provide a model for Johnson & Johnson's corporate communication function, because its culture is unique. As he explained to us: "Johnson & Johnson is a consensus management organization, a culture of shared understanding about how to run the business, not a culture of elaborate rules." Building consensus—rather than imposing one's formal authority and evoking rules—characterizes the way that work is done even at the most senior level of the organization.

Along with a culture of consensus building, Johnson & Johnson has a decentralized structure on which it places a very high value. Decentralization is so important a value that it is inscribed in one of the company's rare written statements about the company's strategic direction and is held

in high regard as a primary source of productivity and innovative ideas. As further indication of the importance of this value, all strategic planning occurs at the operations level where senior managers make financial forecasts that are then rolled into an overarching corporate plan.

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Along with a culture of consensus building, Johnson & Johnson has a decentralized structure on which it places a very high value. Decentralization is so important a value that it is inscribed in one of the company's rare written statements about the company's strategic direction and is held in high regard as a primary source of productivity and innovative ideas. As further indication of the importance of this value, all strategic planning occurs at the operations level where senior managers make financial forecasts that are then rolled into an overarching corporate plan. How, then, is Nielsen able to help craft a cohesive voice for the company while he has no control over its parts and pieces, nearly 200 autonomous operating companies? To build consensus, Nielsen chairs a monthly Public Affairs Advisory Group. The group is composed of everyone at headquarters who has responsibility for external constituencies, the heads of the public relations groups at the major operating units and such corporate staff functions as regulatory actions, investor relations, legal, advertising, and environmental safety and health. Discussion ranges from what's in the news that may concern Johnson & Johnson's reputation to investor relations, corporate philanthropy, and new legislation.

In addition, despite the large number of operating companies, Johnson & Johnson has created a climate of understanding and cohesiveness among internal constituencies around a set of values stated in the Credo, including the importance of reputation. As Nielsen has described this, "The key to Johnson & Johnson's global standing is the strength of its reputation in the United States." He, then, gives this value a central place in the work of the division he runs. The division is in charge of tracking issues that make up corporate reputation, such as the company's core messages about the quality and integrity of its management, products and services; its use of corporate assets, financial soundness, and value as a long-term investment; its innovation; its community and environmental responsibility; and its ability to attract, develop, and keep the brightest and most talented people. Operating managers are encouraged to contact the corporate communication group when issues arise in the operating unit that can potentially affect how people regard the cooperation. For any issue below that on the radar screen, Nielsen's group does

not have to be contacted; rather, the individual companies decide on their own about such matters. As he explained to us, “If we put out a rule, the whole organization would come to a crawl. It comes down to individual judgment, lots of one-on-one talk, and meetings between me and other managers.” Johnson and Johnson has taken first place in the annual reputation survey conducted by the market research firm of Harris Interactive and the Reputation Institute since the inception of the survey in 1999. In other words, Johnson & Johnson is the most highly regarded company in the United States.

Building relationships with senior management also facilitates the work of Nielsen’s group. Of the 100,000 employees at Johnson & Johnson, about 18,000 are managers. When a new operating manager comes on board, Nielsen will send a note, phone, or send an e-mail, saying “Please stop by next time you’re in New Brunswick.” The manager soon learns that Nielsen has the ear of the CEO and can lobby for ideas internally. In addition to face-to-face communications with senior managers Nielsen has revamped the management magazine, *Worldwide News Digest*, to reflect senior management’s concerns with business issues of strategic importance. Rather than presenting “show-and-tell” anecdotal information, he places emphasis on stories that affect business development.

9. Use of Propaganda in Advertising

BY ABEY FRANCIS MARKETING MANAGEMENT

Propaganda is a “systematic, widespread dissemination or promotion of particular ideas, doctrines, practices, etc. Some use it to cause or to damage an opposing one.” While it is true that many of the techniques associated with propaganda are also used in the practice of advertising or public relations, the term propaganda is usually applied to efforts to promote a particular political viewpoint. Additionally, propaganda can be used to promote specific religious views. Furthermore, companies use propaganda to persuade consumers into buying their product, and, sadly, misinformation is found all around people in magazines, on television, on billboards, and in movies. Subconsciously, people let the use of propaganda influence their decision to purchase items that they often would not buy.

Advertisers lean heavily on propaganda to sell products, whether the “products” are a brand of toothpaste, a candidate for office, or a particular political viewpoint. Although propaganda may seem relevant only in the political arena, the concept can be applied fruitfully to the way products and ideas are sold in advertising. All around us, we can see a lot of propaganda ads on television, magazine, newspaper, and etc. Propaganda is a systematic effort to influence people’s opinions, to win them over to a certain view or side. People have been influenced by the propaganda advertisements. Some psychologists’ point of view considers that propaganda is in fact changing our mind and heart, because they make our spirits full of material desires. For instance, sometimes we purchase something that we don’t even need because of our desire.

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Five Types of Propaganda Used in Advertising

There are five types of propaganda used in advertising. The first type is called bandwagon. Bandwagon is persuading a consumer by telling them that others are doing the same thing. An example is in soft drink adverts there will be many attractive young people having fun on a beach. This method is commonly used is cosmetics adverts, The use of a celebrity model and the affordability of the cosmetics sways the customer’s choice in investing in the product because the celebrity is doing it then it will also make the consumer look as good as the model. The second type is called testimonial. Testimonial is when a product is sold by using words from famous people or an authority figure. An example of testimonial is, “Nine out of ten dentists recommend this type of toothpaste. The next type is transfer, which is when a product is sold by the name or picture of a famous person or thing, but no words from the person or thing, for example political advertisements might use political party slogan to help sell the product. The fourth type of propaganda techniques that is used is repetition. Repetition is when the product’s name is repeated at least four times in the advert. The last type is called emotional words. That is when words that will make a consumer feel strongly about someone or something are used. For example, David Beckham sells his perfume by showing a romantic love scene and just putting the word romance on the advert. The five propaganda techniques can be extremely successful in selling.

Aim of Propaganda in Advertising

The aims of propaganda are to bring a message across to a large group of people with the intention to change or manipulate their views. These influences could be biased or quite untruthful depending on what the propagandist is promoting. The idea of propaganda is sometimes used to encourage or motivate persons where other uses are to present an impression that the propagandist what to create to that particular audience. Some forms of propaganda gives versions of the truth, which could be argued to be the same to advertisements, where other forms are almost untruthful and misleading. The benefits of propaganda can control and influence people’s attitudes in which therefore can often achieve the response the propagandist wanted

from them. The effect of this can be very powerful and strongly mesmerising in terms of people's beliefs to what the propaganda is promoting (even if this is not true). It also has the potential to arouse emotion and a personal response or attitude to the prospective offered by the propagandist. Then, the recipient affected by forms of propaganda would believe that the decision made by them was on their own and independent. It brings a message and strong motifs to an audience that if effective can overwhelm that audience and influence them profoundly. This form of propaganda allows people's conscience to judge or make a decision, influenced through a message or image portrayed by the propagandist, which has the capability to change or manipulate your own views.

Propaganda in advertisements can be powerful and have an extreme impact on an audience. In today's modern culture television companies limit the use of certain advertisements and have numerous restrictions, bound by law, to control and monitor the use propaganda influenced within the advertising campaign broadcasted. There are elements of the truth within the advertisement although such features that are found unknown or inaccurate become a distinctive use of propaganda. In contrast, propaganda has the potential to give versions of the truth and often matters that precipitate no factual information or contain little reliable sources. In advertising the product/message or image the company is attempting to promote must be truthful and able to trust where in comparison to propaganda this can be greatly misleading and untruthful to the extent of the purpose the propagandist is trying to create. These can include exaggerated misconceptions with the intentions to produce psychological, social and cultural change in terms of attitudes and views of an audience.

Therefore propaganda within advertisements, the message can be promoted on a much larger scale, with potential outcomes of public belief and national appeasement receiving the result the propagandist or advertising campaign had attempted to create. The technique using propaganda in advertisements would work well; influencing major populations to consume or follow the campaign published nationwide, change or alter attitudes or beliefs to the message and furthermore gain the support and trust to what the propagandist is promoting. It is almost impossible to imagine advertisement campaigns using propaganda to influence people to its maximum potential or maximum responsive capacity, where great audiences would believe and fall under false pretences of what the propagandist/s is promoting to them. If advertising was to comprise with elements of propaganda people would feel more inclined to listen, read or engage with whatever he/she were promoting.

The major aspects of modern world advertisements and promotion campaigns have been under the influence of technology and worldwide communications to support their cause. These such movements and developing opportunities in the future expanding through countries and the world are likely to have significant impact on peoples and populations in the propaganda and advertisement campaigning departments, readily available to promote and influence various audiences. Propaganda can be sent across in many and all types of media. Propaganda can be radio and television broadcasts, leaflets, posters, hoardings etc.

10. Case study: Tata Motor's Acquisition of Jaguar and Land Rover

BY ABEY FRANCIS MANAGEMENT CASE STUDIES



Tata Motors is the largest multi-holding automobile company in India and it is the fourth largest truck producer in the world. In addition, Tata Motors is also the second largest bus producer in the world, with the revenues of US\$ 8.8 billion in the financial year 2008. Since its establishment in 1945, Tata Motors has grown significantly in the past 60 years with the strategies of joint venture, acquisition and launched new products in different market segments (i.e. passenger cars, commercial vehicles and utility vehicles). A significant breakthrough for Tata was the development and commercialization of the truly Indian cars and they are Tata Indica (1998) and Tata Indigo (2002). Tata Motors has experienced many joint ventures with Daimler Benz, Cummins Engine Co. Inc., and Fiat. In the year 2008, there were two most significant events which have had a momentous impact on the scale of the Company's operations and its global image. The launching of Tata Nano, the world cheapest car and the acquisition of Jaguar and Land Rover, the two iconic British brand have made Tata Motors well known to the people in the world. Tata Motors has proven excellence over the years through continuous strong financial results, market expansion, acquisition, joint ventures and improvement and introduction of new products, it seems to have a promising future. But it failed the expectation as the company was in trouble right after the acquisition of Jaguar and Land Rover (JLR) in June 2008 due to the arrival of global financial crisis. The bridge loan of US\$ 3 billion which used to fund the acquisition of JLR was due on June 2009 and yet at the end of the year 2008, Tata was only able to repay the US\$ 1 billion

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Tata Motor's Acquisition of Jaguar and Land Rover

Tata Motor's Acquisition of Jaguar and Land Rover

On June 02, 2008, India-based Tata Motors completed the acquisition of the Jaguar and Land Rover (JLR) units from the US-based auto manufacturer Ford Motor Company (Ford) for US\$ 2.3 billion, on a cash free-debt free basis. JLR was a part of Ford's Premier Automotive Group (PAG) and were considered to be British icons. Jaguar was involved in the manufacture of high-end luxury cars, while Land Rover manufactured high-end SUVs.

Forming a part of the purchase consideration were JLR's manufacturing plants, two advanced design centers in the UK, national sales companies spanning across the world, and also licenses of all necessary intellectual property rights. Tata Motors had several major international acquisitions to its credit. It had acquired Tetley, South Korea-based Daewoo's commercial vehicle unit, and Anglo-Dutch Steel maker Corus. Tata Motors long-term strategy included consolidating its position in the domestic Indian market and expanding its international footprint by leveraging on in-house capabilities and products and also through acquisitions and strategic collaborations

Analysts were of the view that the acquisition of Jaguar and Land Rover, which had a global presence and a repertoire of well established brands, would help Tata Motors become one of the major players in the global automobile industry.

On acquiring JLR, Rattan Tata, Chairman, Tata Group, said, "We are very pleased at the prospect of Jaguar and Land Rover being a significant part of our automotive business. We have enormous respect for the two brands and will endeavor to preserve and build on their heritage and competitiveness, keeping their identities intact. We aim to support their growth, while

holding true to our principles of allowing the management and employees to bring their experience and expertise to bear on the growth of the business.” Ford had bought Jaguar for US\$ 2.5 billion in 1989 and Land Rover for US\$ 2.7 billion in 2000. However, over the years, the company found that it was failing to derive the desired benefits from these acquisitions.

Ford Motors Company (Ford) is a leading automaker and the third largest multinational corporation in the automobile industry. The company acquired Jaguar from British Leyland Limited in 1989 for US\$ 2.5 billion. After Ford acquired Jaguar, adverse economic conditions worldwide in the 1990s led to tough market conditions and a decrease in the demand for luxury cars. The sales of Jaguar in many markets declined, but in some markets like Japan, Germany, and Italy, it still recorded high sales. In March 1999, Ford established the PAG with Aston Martin, Jaguar, and Lincoln. During the year, Volvo was acquired for US\$ 6.45 billion, and it also became a part of the PAG.

Ford Sells Jaguar and Land Rover

In September 2006, after Allan Mulally (Mulally) assumed charge as the President and CEO of Ford, he decided to dismantle the PAG. In March 2007, Ford sold the Aston Martin sports car unit for US\$ 931 million. In June 2007, Ford announced that it was considering selling JLR.

The Deal

On March 26, 2008, Tata Motors entered into an agreement with Ford for the purchase of Jaguar and Land Rover. Tata Motors agreed to pay US\$ 2.3 billion in cash for a 100% acquisition of the businesses of JLR. As part of the acquisition, Tata Motors did not inherit any of the debt liabilities of JLR – the acquisition was totally debt free.

The Benefits

Tata Motors’ long-term strategy included consolidating its position in the domestic Indian market and expanding its international footprint by leveraging on in-house capabilities and products and also through acquisitions and strategic collaborations. On acquiring JLR, Ratan Tata, Chairman, Tata Group, said, “We are very pleased at the prospect of Jaguar and Land Rover being a significant part of our automotive business. We have enormous respect for the two brands and will endeavor to preserve and build on their heritage and competitiveness, keeping their identities intact. We aim to support their growth, while holding true to our principles of allowing the management and employees to bring their experience and expertise to bear on the growth of the business.”

Tata Motors stood to gain on several fronts from the deal. One, the acquisition would help the company acquire a global footprint and enter the high-end premier segment of the global automobile market. After the acquisition, Tata Motors would own the world’s cheapest car – the US\$ 2,500 Nano, and luxury marques like the Jaguar and Land Rover. Two, Tata also got two

advance design studios and technology as part of the deal. This would provide Tata Motors access to latest technology which would also allow Tata to improve their core products in India, for eg, Indica and Safari suffered from internal noise and vibration problems. Three, this deal provided Tata an instant recognition and credibility across globe which would otherwise would have taken years. Four, the cost competitive advantage as Corus was the main supplier of automotive high grade steel to JLR and other automobile industry in US and Europe. This would have provided a synergy for TATA Group on a whole. The whole cost synergy that can be created can be seen in the following diagram. Five, in the long run TATA Motors will surely diversify its present dependence on Indian markets (which contributed to 90% of TATA's revenue). Along with it due to TATA's footprints in South East Asia will help JLR do diversify its geographic dependence from US (30% of volumes) and Western Europe (55% of volumes).

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The Road Ahead

Morgan Stanley reported that JLR's acquisition appeared negative for Tata Motors, as it had increased the earnings volatility, given the difficult economic conditions in the key markets of JLR including the US and Europe. Moreover, Tata Motors had to incur a huge capital expenditure as it planned to invest another US\$ 1 billion in JLR. This was in addition to the US\$ 2.3 billion it had spent on the acquisition. Tata Motors had also incurred huge capital expenditure on the development and launch of the small car Nano and on a joint venture with Fiat to manufacture some of the company's vehicles in India and Thailand. This, coupled with the downturn in the global automobile industry, was expected to impact the profitability of the company in the near future.

Worldwide car sales are down 5% as compared to the previous year. The automobile industry the world over is rationalizing production facilities, reducing costs wherever possible, consolidating brands and dropping model lines and deferring R&D projects to conserve funds. The Chinese and Indian domestic markets for cars have been exceptions.

While China has witnessed a significant reduction in its automotive-related exports and supplies to automobile companies, the Chinese domestic car market has grown by 7%. In India the passenger car market has remained more or less flat compared to the previous year.

Since then, its fortunes have been unsure, as the slump in demand for automobiles has depressed its revenues at the same time Tata has invested nearly \$400 million in the Nano launch and struggled to pay off the expensive \$3 billion loans it racked up for the Jaguar/Land Rover shopping bill. Within the space of a year, Tata Motors has gone from being a developing-world success story to a cautionary tale of bad timing and overly ambitious expansion plans.

Tata Motors' standalone Indian operations' profits declined by 51% in 2008-09 over the previous year. All through the fiscal year ended March 2009 the company bled money, losing a record \$517 million on \$14.7 billion in revenues, just on its India operations. Jaguar and Land Rover lost an additional \$510 million in the 10 months Tata owned it until March 2009. In January 2009, Tata Motors announced that due to lack of funds it may be forced to roll over a part of the US\$ 3 billion bridge loan after having repaid around US\$ 1 billion. The financial burden on Tata Motors was expected to increase further with the pension liability of JLR coming up for evaluation in April 2009.

11. Case Study: FERA Violations by ITC

BY ABEY FRANCIS MANAGEMENT CASE STUDIES

ITC was started by UK-based tobacco major BAT (British American Tobacco). It was called the Peninsular Tobacco Company, for cigarette manufacturing, tobacco procurement and processing activities. In 1910, it set up a full-fledged sales organization named the Imperial Tobacco Company of India Limited. To cope with the growing demand, BAT set up another cigarette manufacturing unit in Bangalore in 1912. To handle the raw material (tobacco leaf) requirements, a new company called Indian Leaf Tobacco Company (ILTC) was incorporated in July 1912. By 1919, BAT had transferred its holdings in Peninsular and ILTC to Imperial. Following this, Imperial replaced Peninsular as BAT's main subsidiary in India.

By the late 1960s, the Indian government began putting pressure on multinational companies to reduce their holdings. Imperial divested its equity in 1969 through a public offer, which raised the shareholdings of Indian individual and institutional investors from 6.6% to 26%. After this, the holdings of Indian financial institutions were 38% and the foreign collaborator held 36%. Though Imperial clearly dominated the cigarette business, it soon realized that making only a single product, especially one that was considered injurious to health, could become a problem. In addition, regular increases in excise duty on cigarettes started having a negative impact on the company's profitability. To reduce its dependence on the cigarette and tobacco business, Imperial decided to diversify into new businesses. It set up a marine products export division in 1971. The company's name was changed to ITC Ltd. in 1974. In the same year, ITC reorganized itself and emerged as a new organization divided along product lines.

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In 1994, ITC commissioned consultants McKinsey & Co. to study the businesses of the company and make suitable recommendations. McKinsey advised ITC to concentrate on its core strengths and withdraw from agri-business where it was incurring losses. During the late 1990s, ITC decided to retain its interests in tobacco, hospitality and paper and either sold off or gave up the controlling stake in several non-core businesses. ITC divested its 51% stake in ITC Agrotech to ConAgra of the US. Tribeni Tissues (which manufactured newsprint, bond paper, carbon and thermal paper) was merged with ITC.

By 2001, ITC had emerged as the undisputed leader, with over 70% share in the Indian cigarette market. ITC's popular cigarette brands included Gold Flake, Scissors, Wills, India Kings and Classic

Allegations:

A majority of ITC's legal troubles could be traced back to its association with the US based Suresh Chitalia and Devang Chitalia (Chitalias). The Chitalias were ITC's trading partners in its international trading business and were also directors of ITC International, the international trading subsidiary of ITC. In 1989, ITC started the 'Bukhara' chain of restaurants in the US, jointly with its subsidiary ITC International and some Non-Resident Indian (NRI) doctors. Though the venture ran into huge losses, ITC decided to make good the losses and honour its commitment of providing a 25% return on the investments to the NRI doctors. ITC sought Chitalias' help for this.

According to the deal, the Chitalias later bought the Bukhara venture in 1990 for around \$1 million. Investors were paid off through the Chitalias New-Jersey based company, ETS Fibers, which supplied waste paper to ITC Bhadrachalam. To compensate the Chitalias, the Indian Leaf Tobacco Division (ILTD) of ITC transferred \$4 million to a Swiss bank account, from where the money was transferred to Lokman Establishments, another Chitalia company in Liechtenstein.

Lokman Establishments made the payment to the Chitalias. This deal marked the beginning of a series of events that eventually resulted in the company being charged for contravention of FERA regulations.

During the 1980s, ITC had emerged as one of the largest exporters in India and had received accolades from the government. This was a strategic move on ITC's part to portray itself as a good corporate citizen' earning substantial foreign exchange for the country. In the early 1990s, ITC started exporting rice to West Asia. When the Gulf war began, ITC was forced to withdraw rice exports to Iraq, which resulted in large quantities of rice lying waste in the warehouses. ITC tried to export this rice to Sri Lanka, which however turned out to be a damp squib because the rice was beginning to rot already. There were discussions in the Colombo parliament as to the quality of the rotting rice. This forced ITC to import the rice back to India, which was not allowed under FERA.

There were a host of other such dubious transactions, especially in ITC's various export deals in the Asian markets. The company, following the Bukhara deal, had set up various front companies (shell or bogus companies) with the help of the Chitalias. Some of the front companies were Hup Hoon Traders Pvt. Ltd., EST Fibers, Sunny Trading, Fortune Tobacco Ltd., Cyprus, Vaam Impex & Warehousing, RS Commodities, Sunny Snack Foods and Lokman Establishment, the one involved in the Bukhara deal. These front companies were for export transactions. It was reported that ITC artificially hiked its profits by over-invoicing imports and later transferring the excess funds as export proceeds into India. Analysts remarked that ITC did all this to portray itself as the largest exporter in the country.

In 1991, ITC asked all its overseas buyers to route their orders through the Chitalias. The Chitalias over-invoiced the export orders, which meant they paid ITC more than what they received from overseas buyers. For instance, in an export deal to Sri Lanka, ITC claimed to have sold rice at \$350 per ton – but according to ED, the rice was actually sold for just \$175 per ton. ITC compensated the difference in amount to the Chitalias through various means including under invoicing other exports to them, direct payments to Chitalia companies and through ITC Global Holdings Pte Ltd. (ITC Global), a Singapore-based subsidiary of ITC. ITC Global was involved in a number majority of the money laundering deals between ITC and Chitalias.

However, by 1995, ITC Global was on the verge of bankruptcy because of all its cash payments to the Chitalias. It registered a loss of US \$ 16.34 million for the financial year 1995-96, as against a profit of US \$1.7 million in 1994-95. The loss was reportedly due to the attrition in trade margins, slow moving stock and bad debts in respect of which provisions had to be made.

It was also reported that ITC Global incurred a loss of \$20 million on rice purchased from the Agricultural Products Export Development Authority (APEDA), which was underwritten by the Chitalias. By the time this consignment was exported to S Armagulam Brothers in Sri Lanka through Vaam Impex, another ITC front company, there was an acute fall in international rice prices. The consignee (S Armagulam Brothers) rejected the consignment because of the delay in

dispatch. Following this, ITC bought back that rice and exported it to Dubai, which was against FERA.

This resulted in huge outstanding debts to the Chitalias, following which they turned against ITC and approached BAT complaining of the debts and other financial irregularities at ITC in late 1995. BAT, which was not on good terms with Chugh, reportedly took this as an opportunity to tarnish his reputation and compel him to resign. BAT appointed a renowned audit firm Lovelock and Lewes to probe into the irregularities at ITC. Though the audit committee confirmed the charges of financial irregularities at ITC during the early 1990s and the role of the Chitalias in the trading losses and misappropriations at ITC during the year 1995-96, it cleared Chugh of all charges. Chugh agreed to resign and BAT dropped all charges against him. He was given a handsome severance package as well as the 'Chairman Emeritus' status at ITC. However according to industry sources, though the Chitalias were on good terms with ITC, it was BAT, which instigated the Chitalias to implicate the top management of ITC. BAT reportedly wanted to 'step in as a savior' and take control of ITC with the active support of the FI nominees on the board, which had supported ITC before charges of unethical practices surfaced.

Meanwhile, the Chitalias filed a lawsuit against ITC in US courts to recover their dues. They alleged that ITC used them to float front companies in foreign countries in order to route its exports through them. They also alleged ITC of various wrongdoings in the Bukhara deal. These events attracted ED's attention to the ongoings at ITC and it began probing into the company's operations. ED began collecting documents to prove that ITC had violated various FERA norms to pay the NRI Doctors.

FERA Violations

The ED found out that around \$ 83 million was transferred into India as per ITC's instructions on the basis of the accounts maintained by the Chitalia group of companies. According to the ED officials, the ITC management gave daily instructions to manipulate the invoices related to exports in order to post artificial profits in its books. A sum of \$ 6.5 million was transferred from ITC Global to the Chitalias' companies and the same was remitted to ITC at a later date. Another instance cited of money laundering by ITC was regarding the over-invoicing of machinery imported by ITC Bhadrachalam Paperboards Ltd., from Italy. The difference in amount was retained abroad and then passed to the Chitalias, which was eventually remitted to ITC.

The ED issued chargesheets to a few top executives of ITC and raided on nearly 40 ITC offices including the premises of its top executives in Kolkata, Delhi, Hyderabad, Guntur, Chennai and Mumbai. The chargesheets accused ITC and its functionaries of FERA violations that included over-invoicing and providing cash to the Chitalias for acquiring and retaining funds abroad, for bringing funds into India in a manner not conforming to the prescribed norms, for not realizing outstanding export proceeds and for acknowledging debt abroad TABLE II

Overview of FERA Violations by ITC

ILTD transferred \$4 million to a Swiss bank account. The amount was later transferred to Lokman Establishment, which in turn transferred the amount to a Chitalia company in the US. ITC also made payments to non-resident shareholders in the case of certain settlements without the permission of the RBI. This was against Sections 8(1) and 9(1)(a) of FERA; ITC under-invoiced exports to the tune of \$1.35 million, thereby violating the provisions of Sections 16(1)(b) and 18(2); ITC transferred funds in an unauthorized manner, to the tune of \$0.5 million outside India by suppressing facts with regard to a tobacco deal. This was in contravention of Section a (1) read with Section 48; ITC acquired \$0.2 million through counter trade premium amounting to between 3 and 4 per cent on a total business of 1.30 billion, contravening Section 8(1); The company had debts to the tune of 25 million due to over-invoicing in coffee and cashew exports during 1992- 93 to the Chitalias, contravening Section 9(1)(c) read with Section 26(6); G. K. P. Reddi, R. K. Kutty, Dr. E. Ravindranath and M. B. Rao also violated the provisions of Sections 8(1), 9(1)(a), 9(1)(c), 16(b), 18(2) and 26(6) read with Section 68 of FERA. (Source: ICMR)

The ED also investigated the use of funds retained abroad for personal use by ITC executives. Though the ED had documentary proof to indicate illegal transfer of funds by top ITC executives, nothing was reported in the media. The top executives were soon arrested. In addition, the ED questioned many executives including Ashutosh Garg, former chief of ITC Global, S Khattar, the then chief of ITC Global, the Chitalias, officials at BAT and FI nominees on ITC board.

Meanwhile, the Chitalias and ITC continued their court battles against each other in the US and Singapore. ITC stated that the Chitalias acted as traders for ITC's commodities including rice, coffee, soyabeans and shrimp. ITC accused the Chitalias of non-payment for 43 contracts executed in 1994. ITC sued the Chitalias seeking \$12.19 million in damages that included the unpaid amount for the executed contracts plus interest and other relief. Following this, the Chitalias filed a counter-claim for \$55 million, accusing ITC of commission defaults (trading commission not paid) and defamation.

In August 1996, the Chitalias indicated to the Government of India and the ED their willingness to turn approvers in the FERA violation case against ITC, if they were given immunity from prosecution in India. The government granted the Chitalias, immunity under section 360 of the Indian Criminal Procedure Act, following which the Chitalias were reported to have provided concrete proof of large scale over-invoicing by ITC mainly in the export of rice, coffee and cashew nuts. In another major development, a few directors and senior executives of ITC turned approvers in the FERA violation case against the company in November 1996. A top ED official confirmed the news and said that these officials were ready to divulge sensitive information related to the case if they were given immunity against prosecution, as granted to the Chitalias.

The same month, the High Court of Singapore appointed judicial managers to take over the management of ITC Global. They informed ITC that ITC Global owed approximately US \$ 49

million to creditors and sought ITC's financial support to settle the accounts. Though ITC did not accept any legal liability to support ITC Global, it offered financial assistance upto \$26 million, subject to the consent and approval of both the Singapore and Indian governments.

In December 1996, most of the arrested executives including Chugh, Sapru, R. Ranganathan, R K Kutty, E Ravindranathan, and K.P. Reddi were granted bail. ITC sources commented that BAT instigated the Chitalias to sue and implicate its executives. BAT was accused of trying to take over the company with the help of the financial institutions (FIs), who were previously on ITC's side. In November 1996, BAT nominees on the ITC board admitted that BAT was aware of the financial irregularities and FERA violations in ITC. However, BAT authorities feigned ignorance about their knowledge of the ITC dealings and charges of international instigation against ITC.

According to analysts, ITC landed in a mess due to gross mismanagement at the corporate level. Many industrialists agreed that poor corporate governance practices at ITC were principally responsible for its problems. They remarked that nominees of the FI and BAT never took an active part in the company's affairs and remained silent speculators, giving the ITC nominees a free hand. R.C. Bhargava, Chairman, Maruti Udyog, said, "It is difficult to believe that FIs and BAT nominees had no idea of what was going on. The board members have many responsibilities. They need to ask for more disclosures and information." Few industry observers also commented that ITC followed a highly centralized management structure where power vested in the hands of a few top executives

However, some other analysts claimed that problems associated with India's legal system were equally responsible for the ITC fiasco. Subodh Bhargava, Vice-Chairman, Eicher Group remarked, "The root cause for a case like ITC to occur is the complexity of laws in our country and the continuing controls like FERA. We have to admit that the limits imposed on industry are not real and, therefore, every opportunity is sought to get around them. This leads to different interpretations of the law and so legal violations occur"

The Aftermath – Setting Things Right

Alarmed by the growing criticism of its corporate governance practices and the legal problems, ITC took some drastic steps in its board meeting held on November 15, 1996. ITC inducted three independent, non-executive directors on the Board and repealed the executive powers of Saurabh Misra, ITC deputy chairman, Feroze Vevaina, finance chief and R.K. Kutty, director. ITC also suspended the powers of the Committee of Directors and appointed an interim management committee. This committee was headed by the Chairman and included chief executives of the main businesses to run the day-to-day affairs of the company until the company had a new corporate governance structure in place.

ITC also appointed a chief vigilance officer (CVO) for the ITC group, who reported independently to the board. ITC restructured its management and corporate governance practices in early 1997. The new management structure comprised three tiers- the Board of Directors (BOD), the Core Management Committee (CMC) and the Divisional Management Committee

(DMC), which were responsible for strategic supervision, strategic management, and executive management in the company respectively.

Through this three-tiered interlinked governance process, ITC claimed to have struck a balance between the need for operational freedom, supervision, control and checks and balances. Each executive director was responsible for a group of businesses/corporate functions, apart from strategic management and overall supervision of the company

However, the company's troubles seemed to be far from over. In June 1997, the ED issued showcause notices to all the persons who served on ITC's board during 1991-1994 in connection with alleged FERA violations. The ED also issued notices to the FIs and BAT nominees on the ITC board charging them with FERA contravention. In September 1997, the ED issued a second set of show-cause notices to the company, which did not name the nominees of BAT and FIs. These notices were related to the Bukhara restaurant deal and the irregularities in ITC's deals with ITC Global.

In late 1997, a US court dismissed a large part of the claim, amounting to \$ 41 million, sought by the Chitalias from ITC and ordered the Chitalias to pay back the \$ 12.19 million claimed by ITC. The Chitalias contested the decision in a higher court, the New Jersey District court, which in July 1998 endorsed the lower court's order of awarding \$ 12.19 million claim to ITC. It also dismissed the claim for \$ 14 million made by the Chitalias against ITC. The judgment was in favor of ITC as the US courts felt that the Chitalias acted in bad faith in course of the legal proceedings, meddled with the factual evidence, abused information sources and concealed crucial documents from ITC. Following the court judgment, the Chitalias filed for bankruptcy petitions before the Bankruptcy Court in Florida, which was contested by ITC.

In early 2001, the Chitalias proposed a settlement, which ITC accepted. Following the agreement, the Chitalias agreed to the judgement of the Bankruptcy Court, which disallowed their Bankruptcy Petitions. As a part of this settlement ITC also withdrew its objections to few of the claims of Chitalias, for exemption of their assets. However, ITC's efforts to recover its dues against the Chitalias continued even in early 2002. The company and its directors inspected documents relating to the notices, with the permission of the ED, to frame appropriate replies to the notices. It was reported that ITC extended complete cooperation to the ED in its investigations.

However, the ED issued yet another show-cause notice (the 22 notice so far) to ITC in June 2001, for violating section 16 of FERA, in relation to ITC's offer to pay \$ 26 million to settle ITC Global's debts (under section 16 of FERA, a company should take prior permission from the RBI, before it can forgo any amount payable to it in foreign exchange). ITC replied to the showcase notice in July 2001, stating it did not accept any legal liabilities while offering financial support to ITC Global. On account of the provisions for appeals and counter-appeals, these cases stood unresolved even in early 2002. However, ITC had created a 1.9 million contingency fund for future liabilities.

Although the company went through a tough phase during the late 1990s, it succeeded in retaining its leadership position in its core businesses through value additions to products and

services and through attaining international competitiveness in quality and cost standards. Despite various hurdles, the company was a financial success, which analysts mainly attributed to the reformed corporate governance practices. What remains to be seen is whether the company would be able to come out unscathed from the various charges of unethical practices against it.

Bad Impact Caused by the Use of Propaganda in Advertising

With false advertisement on one hand and deceitful public relations on the other it is difficult not to be affected. As an overweight person it was always difficult to watch infomercials with false claims of weight reduction, or TV commercials claiming their makeup would create a “flawless finish”, because inevitably it never worked. However, the media is full of thin, beautiful people with flawless skin and trim bodies. The result of the misleading advertising and the impression that perfection was attainable made the failure of reaching that goal destructive. The media impresses falsely that flawlessness is the norm and the epitome of beauty. Poor self-esteem often leading to depression was not only a personal and painful result of this perception but is an epidemic among young women across the country. The negative impact of advertising and the poor reputation of public relations officials created a general distrust of media in general. Public relations are supposed to be mutually beneficial, but when companies have been found guilty of manipulating events and information to suit their purposes only, they cannot be trusted fully. The lack of trust in the media fuelled a desire to actively research products and services before committing to them and to become self educated on public issues so as not to depend on the media for the entire truth.

It is a person’s right to know the truth, whether it be a product, service, or public relations issue. The self educating tactic turned the destructive force behind the media into an action of empowerment. Would this act of empowerment have occurred otherwise? If people were shielded from the media would they seek to inform themselves? Maybe, but for the majority of the population the answer is probably “no”, simply because they would be unaware of what they were missing. The desire to seek out the truth is not there if one is unaware that there is an untruth to begin with. Furthermore, without the media world issues and events would remain mostly isolated. Our knowledge of the world around us is in great part due to the media. Admittedly, without the influence of the media esteem issues would probably remain though to a much lesser extent, but products would be less exciting and probably less effective than they are now.

Regardless of the annoyances and potential destruction that advertising and public relations can cause it is a reality that they serve an important purpose. Without public relations no one would feel the need to inform or educate the public at all regarding events that involve or affect them and the world they live in. Without advertisements companies would not strive to improve their products over the competition thus creating superior products. Without these driving forces in people’s lives there would be an information gap of incredible magnitude and a lack of creativity. Although potentially destructive without firm operating standards, codes of ethics and legal ramifications, advertising and public relations are undeniably important aspects of our culture.

12. Case Study on FEMA: RBI slapped Rs.125 crore on Reliance Infrastructure

BY ABEY FRANCIS MANAGEMENT CASE STUDIES

The Reserve Bank of India (RBI) has asked the Anil Dhirubhai Ambani Group firm, Reliance Infrastructure (earlier, Reliance Energy), to pay just under Rs 125 crore as compounding fees for parking its foreign loan proceeds worth \$300 million with its mutual fund in India for 315 days, and then repatriating the money abroad to a joint venture company. These actions, according to an RBI order, violated various provisions of the Foreign Exchange Management Act (FEMA).

In its order, RBI said Reliance Energy raised a \$360-million ECB on July 25, 2006, for investment in infrastructure projects in India. The ECB proceeds were drawn down on November 15, 2006, and temporarily parked overseas in liquid assets. On April 26, 2007, Reliance Energy repatriated the ECB proceeds worth \$300 million to India while the balance remained abroad in liquid assets.

It then invested these funds in Reliance Mutual Fund Growth Option and Reliance Floating Rate Fund Growth Option on April 26, 2007. On the following day, i.e., on April 27 2007, the entire money was withdrawn and invested in Reliance Fixed Horizon Fund III Annual Plan series V. On March 5, 2008, Reliance Energy repatriated \$500 million (which included the ECB proceeds repatriated on April 26, 2007, and invested in capital market instruments) for investment in capital of an overseas joint venture called Gourock Ventures based in British Virgin Islands.

RBI said, under FEMA guidelines issued in 2000, a borrower is required to keep ECB funds parked abroad till the actual requirement in India.

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RBI said, under FEMA guidelines issued in 2000, a borrower is required to keep ECB funds parked abroad till the actual requirement in India. Further, the central bank said a borrower cannot utilise the funds for any other purpose.

“The conduct of the applicant was in contravention of the ECB guidelines and the same are sought to be compounded,” the RBI order signed by its chief general manager Salim Gangadharan said.

During the personal hearing on June 16, 2008, Reliance Energy, represented by group managing director Gautam Doshi and Price waterhouse Coopers executive director Sanjay Kapadia, admitted the contravention and sought compounding. The company said due to unforeseen circumstances, its Dadri power project was delayed. Therefore, the ECB proceeds of \$300 million were brought to India and was parked in liquid debt mutual fund schemes, it added.

Rejecting Reliance Energy’s contention, RBI said it took the company 315 days to realise that the ECB proceeds are not required for its intended purpose and to repatriate the same for alternate use of investment in an overseas joint venture on March 5, 2008.

Reliance also contended that they invested the ECB proceeds in debt mutual fund schemes to ensure immediate availability of funds for utilisation in India.

“I do not find any merit in this contention also as the applicant has not approached RBI either for utilising the proceeds not provided for in the ECB guidelines, or its repatriation abroad for investment in the capital of the JV,” the RBI official said in the order.

In its defence, the company said the exchange rate gain on account of remittance on March 5 2008, would be a notional interim rate gain as such exchange rate gain is not crystallised.

But RBI does not think so. “They have also stated that in terms of accounting standard 11 (AS 11), all foreign exchange loans have to be restated and the difference between current exchange rate and the rate at which the same were remitted to India, has to be shown as foreign exchange loss/gain in profit and loss accounts.

However, in a scenario where the proceeds of the ECB are parked overseas, the exchange rate gains or losses are neutralized as the gains or losses restating of the liability side are offset with corresponding exchange losses or gains in the asset. In this case, the exchange gain had indeed been realised and that too the additional exchange gain had accrued to the company through an unlawful act under FEMA,” the order said.

It said as the company has made additional income of Rs 124 crore, it is liable to pay a fine of Rs 124.68 crore. On August this year, the company submitted another fresh application for

compounding and requested for withdrawal of the present application dated April 17, 2008, to include contravention committed in respect of another transaction of ECB worth \$150 million. But RBI said the company will have to make separate application for every transaction and two transactions are different and independent and cannot be clubbed together.

14. Factors Influencing the Consumer Decision Making Process

BY ABEY FRANCIS MARKETING MANAGEMENT

Each buying decision you make involves an elaborate mental thought process, a degree of active reasoning, though on the surface it may not always seem to be so. This may be because over a period of time you have taken certain buying decisions so many times that they now seem to be made almost automatically but that is not true at all. Even your daily decision of buying a loaf of bread involves the element of active reasoning as buying a new sofa set for your drawing room. However, in the former case, the extent and intensity of active reasoning may be much less as compared to the latter case. In the case of bread, the only decision variables may be which brand, quantity and retail outlet. But in the case of buying a sofa set the decision variables are far more in number. These may be:

Ready-made or made to order

From a furniture shop or to be built at home

Type of material for frame: wood, steel, aluminum

Type of material for cushion: cloth, rexine, leather

Design: with or without armrests, height, depth of seat, seating capacity, loose or fixed cushion.

Thus, depending on the type of decision being made, the degree and strength of active reasoning will vary. There are three factors, which influence the degree of active reasoning that is undertaken by the consumer in his process of decision-making. These are:

1. Involvement

The degree of personal involvement is a key factor in shaping the type of decision process that consumers will be followed.

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1. Involvement

The degree of personal involvement is a key factor in shaping the type of decision process that consumers will be followed. Involvement is the level of perceived personal importance and/or interest evoked by a stimulus within a specific situation. When a product is perceived to be of great importance to the customer, such as personal clothing, or its purchase involves a great deal of money or risk such as jeweler, car, house, company shares, the level of involvement in making the decision is likely to be very high. The consumer is likely to spend a great deal of time before arriving at the final decision. In contrast, when buying items which do not reflect much on the consumer's personality or their purchase involves small amounts of money or the risks associated with them is not high, the degree of involvement of the consumer is likely to be low. Products such as shoes, polish, toilet soap, toothpaste, biscuits etc. would fall in this category. Several factors exist that determine the degree of involvement consumers have in making a decision. Some of them are as under:

Personal Factors: The degree of involvement tends to be higher when the outcome of the decision affects the person directly. Personal factors include self-image, health, beauty, or physical condition. Without activation of need and drive, there will be no involvement, and it is strongest when the product or service is perceived as enhancing self image. When that is the case, involvement is likely to be enduring and no function as a stable trait, as opposed to being situational or temporary. For example, the purchase of the wedding trousseau, tends to be a high involvement decision because your wedding is a special occasion and it also affects directly your self-image and looks. A consumer's physical handicap may also affect how involved he or she is in buying a home. Are there steps leading up to the house? Is there a bedroom on the first floor, and are doorways wide enough to accommodate a wheel chair?

Product Factors: Products or brands also become involving if there is some perceived risk in purchasing and using them. Many types of perceived risks have been identified, including physical (risk of bodily harm), psychological (especially, a negative effect on self-image), performance (fear that the product will not perform as expected), and financial (risk that outcomes will lead to loss of earnings). As is logical, the greater the perceived risk, the greater the likelihood of high involvement. When perceived risk becomes unacceptably high, there is motivation either to avoid purchase and use altogether or to minimize risk through the search and pre-purchase alternative evaluation stages in extended problem solving. For example, we may become highly involved in the choice of a doctor, especially when surgery is required, because of the high-perceived risk.

Situational Factors: Situational or instrumental involvement includes factors such as whether the product is purchased for personal use or as a gift, and whether it is consumed alone or with others. Situational involvement changes over time. It may be strong on a temporary basis and wanes once purchasing outcomes are resolved. This is usually the case with fads such as trendy clothing items in which involvement is high initially but quickly diminishes once the item is worn and fashions begin to change. There also are times when an otherwise uninvolved product takes on a different degree of relevance because

2. Differentiation

When the consumer perceives that the various alternatives which are available are very different from one another in terms of their features and benefits offered, he is likely to spend more time in gathering information about and evaluating these different features. On the other hand, in case of products which are not very different from one another either in terms of their features or benefits offered, the consumer is bound to perceive them as being almost the same and buy the first available product/brand which satisfies his minimum expectation. He will not like to spend much time in evaluating the various alternatives. The various brands of washing powder available in the market today are an excellent example of low level of differentiation with the

consumer perceiving the different brands to be offering almost identical benefit. All the brands look similar with identical packing and carry almost the same price tag. Till a few years ago the branded shoes was highly undifferentiated with Bata offering standard options to consumers in terms of styles of shoes. Then came the different players in this market like Woodlands and a host of other multinational brands creating on the way a multitude of segments in the otherwise staid shoes market like formal, casual, sports shoes etc.

3. Time Pressure

When you are under pressure to make a decision, you cannot afford to spend a long time finding out about the various products or brands. You would probably buy whatever is readily available. While traveling your car tyre busts and you don't have a spare and hence you need to buy a new one. At that time you would buy the brand that is available at whatever price without giving it too much thought. But under a different situation, when you need to buy new tyres, you would certainly like to find the features of nylon and radial tyres and evaluate various brands on their individual advantages and disadvantages.

Term Paper Questions: Managing Organisation

15. Case Study: Tom (who works for Blocks Ltd.), and Deirdre, (who works for Fones Ltd.), are employed as production managers. Last night, both of them attended a staff development meeting organised by a Production Management Institute (a professional body), of which they are members. During the tea-break, Tom and Deirdre discussed the various leadership styles that they were following in their respective organisations. Tom told Deirdre that he had a friendly personality and was optimistic that he will get on well with the workers in the factory. He went on to say that a total of fifty workers are employed, with 40 of them having been employed with the business for over 20 years. The others, mostly unskilled, tend to be younger workers who stay for a year or so and then move on, since Tom thinks that they are harder to motivate. Tom is aware that new Health & Safety regulations are due to be implemented and this will require discipline in the workforce. He is thinking of adopting a more autocratic leadership style. Deirdre told Tom that she was newly appointed to the role, and was relatively inexperienced. She pointed out that she manages a team of forty workers, grouped into project teams with highly skilled and experienced staff in each team. Deirdre mentioned that her predecessor was unpopular with the workforce since he adopted an autocratic style of leadership. At one stage, the Labour Relations Agency were asked to mediate in a dispute regarding management/employee relations. In view of this, she had been thinking of adopting a democratic leadership style.

Activities:

- Explain the key functions of management within organisations such as Blocks Limited and Fones Limited.
- Discuss whether or not Tom and Deirdre should adopt their proposed new leadership styles within their respective organisations.

- With reference to each organisation (Blocks Limited and Fones Limited), discuss the role of management in motivation.

16.. CASE STUDY: A PROBLEM AT McDonald's

McDonald's Corporation, perhaps the premier hamburger retailer in the world for decades, now faces significant problems. Within the last 10 years, McDonald's share of fast food sales in the United States has slipped almost two percentage points. The drop has come despite in the company's increasing its number of restaurants by 50%, thereby leading the industry. Michael Quinlan, CEO at McDonald's is very disturbed and wants to introduce a new system in his restaurants. Quinlan is an astute manager, and he knows that many problems will arise before the system contributes all that it can to the success of the organization.

Questions:

- Q.1 How should McDonald's try to regain its lost sales by applying the learning organization approach?
- Q.2 List some advantages of adopting the learning organization approach?

Why organizational behavior is significant. Explain?

Discuss the historical evolution of organizational behavior to the present age?

17. CASE STUDY: SENSORY DATA AND PERCEPTION

In a factory, the male chief executive officer feels that women have an equal opportunity for advancement into top management, but the female assistant personnel manager feels there is no way she can break into top management's —good old boy|| network.

In another factory, the head engineer who tours the factory floor once a week in an electric cart feels this is a pleasant place to work, but a punch press operator thinks this place ranks right next to the State prison.

Questions:

- Q.1 Point out the reason for difference in perception in the first case?
- Q.2 Why does the engineer feel 'a pleasant place to work' whereas the operator regards it 'next to prison'? Explain the reason.
- Q.3 How do you visualize a relationship between sensory data and perception?

Discuss the steps in perceptual process?

What is perception? Discuss its nature.

18.. CASE STUDY: APPLYING MOTIVATION THEORIES

You are in-charge of a small department and have three subordinates – Yogesh, Pawan and Kapil. The key to the success of your department is to keep these employees as motivated as possible. Here is a brief summary profile on each of these subordinates.

Yogesh is the type of employee who is hard to figure out. His absenteeism record is much higher than average. He greatly enjoys his family and thinks they should be central to his life. He believes in hippie culture. As a result, the things that the company can offer him really inspire him very little. He feels that the job is simply a means of financing his family's basic needs and little else. Overall, Yogesh does adequate job and is very conscientious, but all attempts to get him to do more have failed. He has charm and his friendly, but he meets the minimal standards of performance. Pawan is

in many aspects different from Yogesh. Like Yogesh, he is a likeable guy, but unlike Yogesh, Pawan responds well to the company's rules and compensation schemes and has a high degree of personal loyalty to the company. The problem with Pawan is that he will not do very much independently. He does well with what is assigned to him, but he is not very creative. He is also a shy person who is not very assertive when dealing with people outside the department. This impacts his performance to certain extent because he cannot immediately sell himself to other departments of company as well to top management.

Kapil, on the other hand, is a very assertive person. He will work for money and would readily change jobs for more money. He really works hard for the company but expects the company also to work for him. In his present job, he feels no qualms about working a 60-hour week, if the money is there. Even though he has a family and is supporting his elder father, he once quit a job when his employer didn't give him a raise on the basis that he was already making too much. He is quite a driver. A manager at his last place of employment indicated that, although Kapil did do an excellent job for the company, his personality was so intense that they were glad to get rid of him. His former boss noted that Kapil just seemed to be pushing all the time. If it wasn't for more money, it was for better fringe benefits; he never seemed satisfied.

Questions

Q.1 Explain Yogesh, Pawan & Kapil motivations by using one or more motivation theories?

Q.2 Who does perceive money as being a direct reward and motivation for performance?

Q.3 How does the equity theory applicable on the motivation levels of Yogesh, Pawan and Kapil?

Discuss and evaluate Alderfer's ERG Theory of motivation?

Explain content and process theories of motivation? Give an example?

19.. CASE STUDY: TROUBLE IN COMMUNICATING

Rakesh Parashar, a former group leader, was become a supervisor about four months ago when Darshan Singh left the company. He recently had some problems with two of his people. Their output has been declining steadily, and by now is well below standard. In addition, his department's overall performance has been slipping. You noticed that the output of his section has dropped off from the last two months. You made a survey personally and found that there are two-three trouble makers in Rakesh's section. But Rakesh was not able to control them and keep them in line. When Rakesh asked he explained —I talked with each one at least twice and tried to lay down the law. I even told them the consequences if they didn't do more and much better work. They've have both been with the company a long time, but I suppose in time I could build up a case against them and get them fired. But I'd probably wind up looking like an ass!

Questions: Q.1 What will you say to Rakesh who has a trouble in his section and who lacks communicating skill?

Q.2 What action will you suggest against the trouble-maker employees?

Q.3 What do you think about firing the trouble-creating employees?

What are various types of communication?

Explain the communication process.

20.. CASE STUDY: INTERGROUP CONFLICT

In a large office an employee named Rozy may feel like a mere payroll number, but her informal group gives her personal attachment and status. With the members of her group she is somebody, even though in the formal structure she is only one of a thousand employees. She may not look

forward to monitoring 750 accounts daily, but the informal group gives more meaning to her day. When she thinks of meeting her friends, sharing their interests, and eating with them, her day takes on a new dimension that makes easier any difficulty or tedious routine in her work. Suddenly Rozy developed some interpersonal and intergroup conflicts with some powerful members of the group. The group did not accept her. Her work became more disagreeable and compelled her to a transfer, to absenteeism and to a resignation.

Questions: Q.1 Although informal groups may lead to several benefits, can these groups prove harmful?

Q.2 Suggest some measures for Rozy to check the dysfunctions of informal groups?

Why do groups form and what are important characteristics of groups?

Explain types of group? Explain the stages of group development with the help of diagram?

What are various methods of group decision making?

21.. CASE STUDY: MANAGING STRESS

(1) Many organizations offer flex-time programmes that allow associates to choose when they come to work and when they depart. Such programmes can help alleviate work-family role conflict and thereby reduce stress.

(2) A small manufacturing company held brainstorming sessions among its associates to uncover the cause of stress they were experiencing. The company used feedback from the meetings to change the nature of work rather than change how people responded. Changes included creating more realistic deadlines, generating more supervisory support and giving associates more involvement in making decisions related to matters affecting them.

Questions:

Q.1 Do you agree with flex-time programme? Do you see any disruptive effects of such strategy?

Q.2 To remove stress, which policy will you prefer – change the employee or change the workplace. Why?

Q.3 On what grounds do you justify the company's strategy in the second case?

What are the causes of stress?

How to manage stress?

22..CASE STUDY: RESISTING CHANGE

Management of your company has decided that a computerized control system is needed to make the company more competitive. It is now scheduled for plant wide installation in a few months. The purpose of the system is to facilitate planning and scheduling, improve material control, reduce inventories, evaluate labor utilization and better control maintenance operations among others. The introduction of the system will take a considerable amount of effort and work on the part of many people. However, resistance of some employees to accept it has arisen. Even without understanding the system, a few of the people seem to feel that in some way they will be hurt by it. Ashutosh Pandey, Manger of the Engineering and Maintenance Department, comes to you to discuss the problem.

—Well, Ashutosh, we should have the new system running in a couple of months if we don't run into some major delays!.—May be, but I have already got some problems in my department. Two guys in the maintenance are really against it. Rajesh and Tarun never seem to miss an opportunity to

badmouth it. What worries me is that they they will talk about the computerized system so much that others will begin to feel the same way about it. Is there anything we can do to counteract that?||
—While you can't stop them from griping and complaining, you may be able to reverse their thinking if you handle them right||.

—How would I do that?|| Ashutosh asks.

Questions:

Q.1 What will you suggest to the manager, Ashutosh, whose people are resisting a company-wide procedure change?

Q.2 What specific guidelines will you suggest for opponent employees to reverse their thinking and to seek their cooperation?

Discuss Lewin's three-step model of change?

Explain the concept of organizational change?

23.. CASE STUDY: INTERGROUP CONFLICT

In a large office an employee named Rozy may feel like a mere payroll number, but her informal group gives her personal attachment and status. With the members of her group she is somebody, even though in the formal structure she is only one of a thousand employees. She may not look forward to monitoring 750 accounts daily, but the informal group gives more meaning to her day. When she thinks of meeting her friends, sharing their interests, and eating with them, her day takes on a new dimension that makes easier any difficulty or tedious routine in her work. Suddenly Rozy developed some interpersonal and intergroup conflicts with some powerful members of the group. The group did not accept her. Her work became more disagreeable and compelled her to a transfer, to absenteeism and to a resignation.

Questions:

Q.1 Although informal groups may lead to several benefits, can these groups prove harmful?

Q.2 Suggest some measures for Rozy to check the dysfunctions of informal groups?

What are functional and dysfunctional concepts of conflict?

Explain the concept of conflict? Also discuss its nature.

Discuss the various strategies for conflict management?

24.CASE STUDY

Tangy spices Ltd, the countries' biggest spices marketer has decided to launch a hostile bid for Italy's major spice marketer Chilliano. This is a rare case of an Indian company making an unsolicited hostile bid for a foreign company. The Tangy Spices Ltd. has competencies in Indian spices. The major destination markets for the Tangy spices Ltd. exports have been the Europe and America. The competencies of Chilliano lie in Italian herbs and spices. The Indian company with the takeover wishes to synergies its operations in the world market. It also wants to take advantage of the reach enjoyed by the Italian company in several countries where its products are not beng sold presently.

The move of hostile takeover follows Chilliano's rejection to an agreement entered a year back. At that time Chilliano was suffering losses and it offered majority shares at a price of € 2.25. A total of 20% shares were

transferred at that time. In one year Chilliano was able to turnaround its operations and the company made handsome profits in the last quarter. The promoters who have residual holding of 35% in the company are reluctant to transfer the shares now. They have rejected the agreement with a plea that the earlier offer price was not sufficient.

Tangy spices Ltd has revised its offer to € 2.95. By this lucrative offer some of the large shareholders of Chilliano reveal their interest for selling their stakes. On the other hand, promoters maintained their position on this matter. Through the process of buying of shares in the market the Tangy spices Ltd. gradually consolidated its holding in Chilliano to 45%. Being a major shareholder they were ready for a takeover. At the same time, Tangy spices Ltd. was trying hard to improve their position so that they do not leave any space for Chilliano's promoters in future.

Read the above case and answer the following questions:

Q (1) What strategic alternative is followed by Tangy spices Ltd?

There are different general strategic alternatives which are also known as Grand Strategies.

- (1) Stability
- (2) Expansion
- (3) Retrenchment
- (4) Combination

Expansion is the most popular strategy followed by organization. In expansion strategy, organizations can expand their operations through acquisition route.

Here Tangy Spicy Limited is following up the expansion strategy by acquiring the Chilliano of Italy.

Q (2) Is the hostile takeover by an Indian company appropriate?

Hostile takeovers are extremely expensive. Acquirer need to be ready to pay extra price than market price of equity. It should be done when a cash rich company sees strategic advantage in that acquisition. Indian companies can do the hostile takeover provided that takeover help them to position much stronger in the market. Additionally, price paid for takeover should be in line with the strengths or values to be achieved from that takeover.

For example, Corus acquisition by TATA STEEL is an example of hostile takeover but takeover positioned the TATA as market leader in steel manufacturing capacity and technologies. So looking at this takeover, it seems if hostile takeover is done with proper long-term strategy than it is quite appropriate for the Indian companies.

Q.(3) Why the Tangy Spices Ltd. is interested in this takeover?

The Tangy Spices Ltd. has competencies in Indian spices. The major destination markets for the Tangy spices Ltd. exports have been the Europe and America. The competencies of Chilliano lie in Italian herbs and spices. Tangy with this takeover will synergies its operations in the world market, particularly in Europe and America—its major exports markets. It also wants to take advantage of the reach enjoyed by the Italian company in several countries where its products are not beng sold presently.

Further, rejection of promoters to transfer the shares as agreed in an agreement entered a year back also prompted the Tangy to go for his takeover.

Q.(4) Why the promoters are reluctant to transfer the shares after the agreement?

Around a year back, the promoters of Chilliano had agreed to transfer the equity share to Tangy at € 2.25 per share. But in one year, Chilliano was able to turnaround its operations and the company made handsome profits in the last quarter. The promoters who have residual holding of 35% in the company become reluctant to transfer the shares now. They have rejected the agreement with a plea that the earlier offer price of € 2.25 per share was not sufficient. So, it is a case where promoters either feel that they are not getting right value for their equity or they do not intend sell equity due to increased profitability of company in the recent past.

25.CASE STUDY

Meters Limited is a company engaged in the designing, manufacturing, and marketing of instruments like speed meters, oil pressure gauges, and so on, that are fitted into two and four wheelers. Their current investment in assets is around Rs. 5 crores and their last year turnover was Rs. 15 crores, just adequate enough to breakeven. The company has been witnessing over the last couple of years, a fall in their market share prices since many customers are switching over to a new range of electronic instruments from the ange of mechanical instruments that have been the mainstay of Meters Limited.

The Company has received a firm offer of cooperation from a competitor who is similarly placed in respect of product range. The offer implied the following:

- (i) transfer of the manufacturing line from the competitor to Meters Limited;
- (ii) manufacture of mechanical instruments by Meters Limited for the competitor to the latter's specifications and brand name; and
- (iii) marketing by the competitor.

The benefits that will accrue to Meters Limited will be better utilization of its installed capacity and appropriate financial ompensation for the manufacturing effort. The production manager of Meters Limited has welcomed the proposal and points out that it will enable the company to make profits. The sales manager is doubtful about the same since the demand for mechanical instruments in shrinking. The chief Executive is studying the offer.

Read the above case and answer the following questions:

Q.(1) What is divestment strategy? Do you see it being practised in the given case? Explain.

Divestment strategy involves retrenchment of some of the activities in a given business of the company or sell-out of some of the businesses.

This strategy is largely followed in the following cases

Obsolescence of product/process

Business becoming unprofitable

High competition

Industry overcapacity

Retrenchment Strategy also includes turnaround of declining business operations.

I don't believe this is being completely followed over here. The company is mainly planning a turnaround of business operation through manufacturing other organization's products in orderto better utilize the manufacturing capacity. However, it seems customers are switching from mechanical instruments to electronic instruments, so this strategy should not be viewed as turnaround of business operations or divestment strategy.

Q.(2) What is stability strategy? Should Meters Limited adopt it?

If a firm is opting for stability of business operations by staying in the same business, same product, market and functions, and firm normally maintains same levels of effort as at present, then it is known as stability strategy.

The main aim of this strategy is to enhance functional efficiencies, better deployment and utilization of resources.

Meters Limited should not adopt the stability strategy. In this strategy, Meters Limited will continue manufacturing the mechanical meters with improved utilization of capacity and reduced costs but we know that market is losing customers base for mechanical meters.

Q(3) What is expansion strategy? What are the implications for Meters Limited in case it is adopted?

Expansion strategy is the most popular strategy and most of the business organizations opt for expansion strategy because this strategy prompts for the growth of business organizations.

There are two key types of expansions strategy

- (1) Intensifications
- (2) Diversifications

Both of them are growth oriented strategies; the difference lies in the way by which the firm actually pursues the growth.

Intensification involves the following:

- Product Development
- Market Penetration
- Market Development

Diversification involves the following:

- Vertically integrated diversification
- Horizontally integrated diversification
- Concentric diversification
- Conglomerate diversification

Yes, company should adopt expansion strategy by adopting intensifications category. In intensification strategy, company can initially focus on product development i.e. developing new electronic instruments and then they can follow market penetration and market development

Q.(4) What are your suggestions to the Chief Executive?

My suggestions to chief executive will be the following:

for the time being, till the time new products are developed, we can accept the offer of other organization to manufacture their products for better utilization of capacity but we have to be cautious about competition / sales of products in the same category and that should be properly laid out in the agreement. However, in the long-term, we should focus on new products developments and try to expand product range by including the manufacturing of electronic instruments.

26.CASE STUDY

Sahni Auto Industries is a manufacturer and exporter of Autoparts with an annual turnover of Rupees one thousand crores. It employs about 2,00 persons in its factory in Punjab and its other offices in India and abroad.

The Personnel Administration and Human Resources Department of the company is headed by Mr. Amit Kapoor-the Chief Personnel Manager. Mr. Amit Kapoor, an automobile Engineer joined the company 5 years ago as Product Development Manager. After a successful stint of 4 years as Product Development Manager, he was transferred to Personnel Administration and Human Resources Department as the Chief Personnel Manager as a part of Career development plan. Mr. Vikas, MBA in Human Resources from a renowned Business school, joined the company as Personnel Manager only 3 months back. He reports to Mr. Amit Kapoor-the Chief Personnel Manager. He handles all routine personnel and industrial relations matters.

One day, during informal discussion with Mr. Amit Kapoor, Mr. Vikas suggested him of linking Human Resources Management with Company's strategic goals and objectives to further improve business performance and also to develop Organisational culture that fosters more innovative ideas. He also advocated creating abundant 'Social Capital' on the ground that people tend to be more productive in an environment which has trust and goodwill embedded in it rather than which is highly hierarchical and formal. Mr. Amit Kapoor disagreed with Mr. Vikas and told him that the role of Human Resources Department was only peripheral to the business and all his suggestions about its strategic role were beyond the purview of Personnel Administration and Human Resources Department. After this, Mr. Vikas started having number of arguments with Mr. Amit Kapoor in several issues relating to personnel and industrial relations since he felt that a person with a degree in Human Resources Management was in a far better position to run Personnel Administration and Human Resources Department. Mr. Amit Kapoor--the Chief Personnel Manager had often shown his displeasure on Mr. Vikas's argumentative - tendency and had made it known to the General Manager.

The General Manager called Mr. Amit Kapoor in his office to inform him that he has been elected for an overseas assignment. He further told him to find a suitable person as his successor; he even suggested Mr. Vikas as a possible candidate. Mr. Amit Kapoor, however, selected Mr. Balram, who was working as Training Manager in a Multinational Company for the last 5 years. Mr. Vikas, soon started having arguments with Mr. Balram also over number of issues relating to industrial relations since he felt that he had no experience in handling industrial relations matters. Mr. Balram now realised that Mr. Vikas was trying to make things difficult for him. After a series of meetings with the General Manager, Mr. Balram eventually succeeded in convincing him to transfer Mr. Vikas to an office outside Punjab. On learning about his impending transfer, Mr. Vikas wrote a letter to the General Manager joining details of various instances, when Mr. Balram had shown his incompetence in handling problematic situations. When asked for explanation by the General Manager, Mr. Balram had refuted almost all the allegations. The General Manager accepted his explanation and informed Mr. Vikas that most of his allegations against Mr. Balram were unwarranted and baseless. He further advised him to avoid confrontation with Mr. Balram. Mr. Vikas then wrote a letter to the Chairman repeating all the allegations against Mr. Balram. On investigation, the Chairman found most of the allegations true. He then called all the three-the General Manager, the Chief Personnel Manager and the Personnel Manager in his office and implored them to forget the past and henceforth to work in coordination with each other in an environment of Trust and Goodwill.

Read the above case and answer the following questions:

Q.(1) Identify and discuss the major issues raised in the case.

This case is related with human resources function. The major issues raised in this case can be defined as follows:

Non-linking of Human Resources Management with Company's strategic goals and objectives.

Lack of organisational culture that fosters more innovative ideas.

Highly hierarchical and formal organizational structure which lacks trust and goodwill and thus lacks productivity.

Human Resources Department was treated as peripheral to the business rather than an integrated function for strategic planning and implementation.

Q.(2) Comment on the recruitment of the two Chief Personnel Managers.

The first Chief Personnel Manager, Mr. Amit Kapoor is an automobile Engineer joined the company 5 years ago as Product Development Manager. After a successful stint of 4 years as Product Development Manager, he was transferred to Personnel Administration and Human Resources Department as the Chief Personnel Manager as a part of Career development plan.

I don't see any disadvantage if a capable person without having formal HR qualification being transferred to the HR department. However, over here this transfer is not with an aim to bring some efficiency in the HR function rather it is a simple transfer from one position to another position; which I think is not correct. For example, Mr M. Pillai, a qualified CA, has been made HR director in the Infosys from his earlier position of finance director. This change in position of Mr. Pillai is considering him as most capable person and Infosys now a company with more 1 lakh employee has the HR more challenging task than the finance. Therefore they transferred the most capable person to HR director from finance director.

The second Chief Personnel Manager, Mr. Balram was earlier working as Training Manager in a Multinational Company for the last 5 years. He also has no formal experience and qualifications in the HR management. I don't think his appointment as chief HR manager was also on any merit or to infuse any efficiency in the HR function.

Q.(3) Would you justify Mr. Vikas's argumentative tendency with the Chief Personnel Managers ? Give reasons for your answer.

I agree with Mr. Vikas argumentative tendency with Chief Personnel Managers regarding enhancing role of HR department and industrial relation in the company strategic management. I also agree with his view that Human Resources Management should be linked with Company's strategic goals and objectives. Because I think HR is as equal and important function as finance and marketing; and better HR management helps organizations to achieve their strategic goals and objectives.

But I don't agree with his view that a person with HR qualifications only can better manage the HR department. As said above, Mr M. Pillai, a qualified CA, has been made HR director in the Infosys from his earlier position of finance director. This change in position of Mr. Pillai is considering him the most capable person and Infosys now a company with more 1 lakh employee has the HR management more challenging task than the finance management.

Q.(4) Do you agree with suggestion offered by Mr. Vikas to Human Resources Management with the company's strategic goals ? If yes, suggest prominent areas where Human Resources Department can play role in this regard.

Yes, I agree with suggestion offered by Mr. Vikas to Human Resources Management with the company's strategic goals. In the the following area the HR department can play a role in this regard:
Providing purposeful direction: The human resource management can lead people and the organization towards the desired direction. The HR manager has to ensure that the objectives of an organization become the objectives of each person working in the organization.

Creating competitive atmosphere: By creating committed and competitive atmosphere through opportunities for employees.

Facilitation of change: The Human resources are more concerned with substance rather than form, accomplishments rather than activities, and practice rather than theory. The human resources should be provided enough opportunities for the same.

Diversified workforce: In the modern organization management of diverse workforce is a great challenge. Workforce diversity can be observed in terms of male and female workers, young and old workers, educated and uneducated workers, unskilled and professional employee, etc. creating a great culture or non-financial incentives also plays an important role in motivating the workforce.

Empowering human resources: Empowerment means authorizing every member of a society or organization to take of his/her own destiny realizing his/her full potential.

Building core competency: The human resource manager has a great role to play in developing core competency by the firm. A core competence is a unique strength of an organization which may not be shared by others in the form marketing and technical capability.

Developing ethical work culture: A vibrant work culture should be developed in the organizations to create an atmosphere of trust among people and to encourage creative ideas by the people.

27. Case Study: Tom (who works for Blocks Ltd.), and Deirdre, (who works for Fones Ltd.), are employed as production managers. Last night, both of them attended a staff development meeting organised by a Production Management Institute (a professional body), of which they are members. During the tea-break, Tom and Deirdre discussed the various leadership styles that they were following in their respective organisations. Tom told Deirdre that he had a friendly personality and was optimistic that he will get on well with the workers in the factory. He went on to say that a total of fifty workers are employed, with 40 of them having been employed with the business for over 20 years. The others, mostly unskilled, tend to be younger workers who stay for a year or so and then move on, since Tom thinks that they are harder to motivate. Tom is aware that new Health & Safety regulations are due to be implemented and this will require discipline in the workforce. He is thinking of adopting a more autocratic leadership style. Deirdre told Tom that she was newly appointed to the role, and was relatively inexperienced. She pointed out that she manages a team of forty workers, grouped into project teams with highly skilled and experienced staff in each team. Deirdre mentioned that her predecessor was unpopular with the workforce since he adopted an autocratic style of leadership. At one stage, the Labour Relations Agency were asked to mediate in a dispute regarding management/employee relations. In view of this, she had been thinking of adopting a democratic leadership style.

Activities:

- Explain the key functions of management within organisations such as Blocks Limited and Fones Limited.
- Discuss whether or not Tom and Deirdre should adopt their proposed new leadership styles within their respective organisations.
- With reference to each organisation (Blocks Limited and Fones Limited), discuss the role of management in motivation.

28. CASE STUDY: A PROBLEM AT McDonald's

McDonald's Corporation, perhaps the premier hamburger retailer in the world for decades, now faces significant problems. Within the last 10 years, McDonald's share of fast food sales in the United States has slipped almost two percentage points. The drop has come despite in the company's increasing its number of restaurants by 50%, thereby leading the industry. Michael Quinlan, CEO at McDonald's is very disturbed and wants to introduce a new system in his restaurants. Quinlan is an astute manager, and he knows that many problems will arise before the system contributes all that it can to the success of the organization.

Questions:

Q.1 How should McDonald's try to regain its lost sales by applying the learning organization approach?

Q.2 List some advantages of adopting the learning organization approach?

Why organizational behavior is significant. Explain?

Discuss the historical evolution of organizational behavior to the present age?

29.CASE STUDY: SENSORY DATA AND PERCEPTION

In a factory, the male chief executive officer feels that women have an equal opportunity for advancement into top management, but the female assistant personnel manager feels there is no way she can break into top management's —good old boy network.

In another factory, the head engineer who tours the factory floor once a week in an electric cart feels this is a pleasant place to work, but a punch press operator thinks this place ranks right next to the State prison.

Questions:

Q.1 Point out the reason for difference in perception in the first case?

Q.2 Why does the engineer feel 'a pleasant place to work' whereas the operator regards it 'next to prison'? Explain the reason.

Q.3 How do you visualize a relationship between sensory data and perception?

Discuss the steps in perceptual process?

What is perception? Discuss its nature.

30. CASE STUDY: APPLYING MOTIVATION THEORIES

You are in-charge of a small department and have three subordinates – Yogesh, Pawan and Kapil. The key to the success of your department is to keep these employees as motivated as possible. Here is a brief summary profile on each of these subordinates.

Yogesh is the type of employee who is hard to figure out. His absenteeism record is much higher than average. He greatly enjoys his family and thinks they should be central to his life. He believes in hippie culture. As a result, the things that the company can offer him really inspire him very little. He feels that the job is simply a means of financing his family's basic needs and little else. Overall, Yogesh does adequate job and is very conscientious, but all attempts to get him to do more have failed. He has charm and is friendly, but he meets the minimal standards of performance. Pawan is in many aspects different from Yogesh. Like Yogesh, he is a likeable guy, but unlike Yogesh, Pawan responds well to the company's rules and compensation schemes and has a high degree of personal loyalty to the company. The problem with Pawan is that he will not do very much independently. He does well with what is assigned to him, but he is not very creative. He is also a shy person who is not very assertive when dealing with people outside the department. This impacts his performance to certain extent because he cannot immediately sell himself to other departments of company as well to top management.

Kapil, on the other hand, is a very assertive person. He will work for money and would readily change jobs for more money. He really works hard for the company but expects the company also to work for him. In his present job, he feels no qualms about working a 60-hour week, if the money is there. Even though he has a family and is supporting his elder father, he once quit a job when his employer didn't give him a raise on the basis that he was already making too much. He is quite a driver. A manager at his last place of employment indicated that, although Kapil did do an excellent job for the company, his personality was so intense that they were glad to get rid of him. His former boss noted that Kapil just seemed to be pushing all the time. If it wasn't for more money, it was for better fringe benefits; he never seemed satisfied.

Questions

Q.1 Explain Yogesh, Pawan & Kapil motivations by using one or more motivation theories?

Q.2 Who does perceive money as being a direct reward and motivation for performance?

Q.3 How does the equity theory applicable on the motivation levels of Yogesh, Pawan and Kapil?

Discuss and evaluate Alderfer's ERG Theory of motivation?

Explain content and process theories of motivation? Give an example?

31. CASE STUDY: TROUBLE IN COMMUNICATING

Rakesh Parashar, a former group leader, was become a supervisor about four months ago when Darshan Singh left the company. He recently had some problems with two of his people. Their output has been declining steadily, and by now is well below standard. In addition, his department's overall performance has been slipping. You noticed that the output of his section has dropped off from the last two months. You made a survey personally and found that there are two-three trouble makers in Rakesh's section. But Rakesh was not able to control them and keep them in line. When Rakesh asked he explained —I talked with each one at least twice and tried to lay down the law. I even told them the consequences if they didn't do more and much better work. They've have both been with the

company a long time, but I suppose in time I could build up a case against them and get them fired. But I'd probably wind up looking like an ass!

Questions: Q.1 What will you say to Rakesh who has a trouble in his section and who lacks communicating skill?

Q.2 What action will you suggest against the trouble-maker employees?

Q.3 What do you think about firing the trouble-creating employees?

What are various types of communication?

Explain the communication process.

32.CASE STUDY: INTERGROUP CONFLICT

In a large office an employee named Rozy may feel like a mere payroll number, but her informal group gives her personal attachment and status. With the members of her group she is somebody, even though in the formal structure she is only one of a thousand employees. She may not look forward to monitoring 750 accounts daily, but the informal group gives more meaning to her day. When she thinks of meeting her friends, sharing their interests, and eating with them, her day takes on a new dimension that makes easier any difficulty or tedious routine in her work. Suddenly Rozy developed some interpersonal and intergroup conflicts with some powerful members of the group. The group did not accept her. Her work became more disagreeable and compelled her to a transfer, to absenteeism and to a resignation.

Questions: Q.1 Although informal groups may lead to several benefits, can these groups prove harmful?

Q.2 Suggest some measures for Rozy to check the dysfunctions of informal groups?

Why do groups form and what are important characteristics of groups?

Explain types of group? Explain the stages of group development with the help of diagram?

What are various methods of group decision making?

33. CASE STUDY: MANAGING STRESS

(1) Many organizations offer flex-time programmes that allow associates to choose when they come to work and when they depart. Such programmes can help alleviate work-family role conflict and thereby reduce stress.

(2) A small manufacturing company held brainstorming sessions among its associates to uncover the cause of stress they were experiencing. The company used feedback from the meetings to change the nature of work rather than change how people responded. Changes included creating more realistic deadlines, generating more supervisory support and giving associates more involvement in making decisions related to matters affecting them.

Questions:

Q.1 Do you agree with flex-time programme? Do you see any disruptive effects of such strategy?

Q.2 To remove stress, which policy will you prefer – change the employee or change the workplace. Why?

Q.3 On what grounds do you justify the company's strategy in the second case?

What are the causes of stress?

How to manage stress?

34..CASE STUDY: RESISTING CHANGE

Management of your company has decided that a computerized control system is needed to make the company more competitive. It is now scheduled for plant wide installation in a few months. The purpose of the system is to facilitate planning and scheduling, improve material control, reduce inventories, evaluate labor utilization and better control maintenance operations among others. The introduction of the system will take a considerable amount of effort and work on the part of many people. However, resistance of some employees to accept it has arisen. Even without understanding the system, a few of the people seem to feel that in some way they will be hurt by it. Ashutosh Pandey, Manger of the Engineering and Maintenance Department, comes to you to discuss the problem.

—Well, Ashutosh, we should have the new system running in a couple of months if we don't run into some major delays!—May be, but I have already got some problems in my department. Two guys in the maintenance are really against it. Rajesh and Tarun never seem to miss an opportunity to badmouth it. What worries me is that they they will talk about the computerized system so much that others will begin to feel the same way about it. Is there anything we can do to counteract that?!

—While you can't stop them from griping and complaining, you may be able to reverse their thinking if you handle them right!.

—How would I do that?! Ashutosh asks.

Questions:

Q.1 What will you suggest to the manager, Ashutosh, whose people are resisting a company-wide procedure change?

Q.2 What specific guidelines will you suggest for opponent employees to reverse their thinking and to seek their cooperation?

Discuss Lewin's three-step model of change?

Explain the concept of organizational change?

35.CASE STUDY: INTERGROUP CONFLICT

In a large office an employee named Rozy may feel like a mere payroll number, but her informal group gives her personal attachment and status. With the members of her group she is somebody, even though in the formal structure she is only one of a thousand employees. She may not look forward to monitoring 750 accounts daily, but the informal group gives more meaning to her day. When she thinks of meeting her friends, sharing their interests, and eating with them, her day takes on a new dimension that makes easier any difficulty or tedious routine in her work. Suddenly Rozy developed some interpersonal and intergroup conflicts with some powerful members of the group. The group did not accept her. Her work became more disagreeable and compelled her to a transfer, to absenteeism and to a resignation.

Questions:

Q.1 Although informal groups may lead to several benefits, can these groups prove harmful?

Q.2 Suggest some measures for Rozy to check the dysfunctions of informal groups?

What are functional and dysfunctional concepts of conflict?

Explain the concept of conflict? Also discuss its nature.

Discuss the various strategies for conflict management?

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36. Case study

Inflation is the rise in prices which occurs when the demand for goods and services exceeds their available supply. In simpler terms, inflation is a situation where too much money chases too few goods. In India, the wholesale price index (WPI), which was the main measure of the inflation rate consisted of three main components - primary articles, which included food articles, constituting 22% of the index; fuel, constituting 14% of the index; and manufactured goods, which accounted for the remaining 64% of the index. For purposes of analysis and to measure more accurately the price levels for different sections of society and as well for different regions, the RBI also kept track of consumer price indices. The average annual GDP growth in the 2000s was about 6% and during the second quarter (July-September) of fiscal 2006-2007, the growth rate was as high as 9.2%. All this growth was bound to lead to higher demand for goods. However, the growth in the supply of goods, especially food articles such as wheat and pulses, did not keep pace with the growth in demand. As a result, the prices of food articles increased. According to Subir Gokarn, Executive Director and Chief Economist, CRISIL, "The inflationary pressures have been particularly acute this time due to supply side constraints [of food articles] which are a combination of temporary and structural factors

."Measures Taken In late 2006 and early 2007, the RBI announced some measures to control inflation. These measures included increasing repo rates, the Cash Reserve Ratio (CRR) and reducing the rate of interest on cash deposited by banks with the RBI. With the increase in the repo rates and bank rates, banks had to pay a higher interest rate for the money they borrowed from the RBI. Consequently, the banks increased the rate at which they lent to their customers. The increase in the CRR reduced the money supply in the system because banks now had to keep more money as reserves. On December 08, 2006, the RBI again increased the CRR by 50 basis points to 5.5%. On January 31, 2007, the RBI increased the repo rate by 25 basis points to 7.5%...Some Perspectives The RBI's and the government's response to the inflation witnessed in 2006-07 was said to be based on 'traditional' anti-inflation measures. However, some economists argued that the steps taken by the government to control inflation were not enough...Outlook several analysts were of the view that the RBI could have handled the 2006-07 inflation without tinkering with the interest rates, which according to them could slow down economic growth. Others believed that high inflation was often seen by investors as a sign of economic mismanagement and sustained high inflation would affect investor confidence in the economy. However, the inflation rate in emerging economies was usually higher than developed economies

- Q1.Explain the concept of Inflation in Indian context.
- Q2. Give out the ways of curbing inflation.
- Q3.Explain the causes of inflation..
- Q4. Explain the repo rate and cash reserve ratio.

37.Case study

In his lecture delivered to the drug manufactures, Mr. R.S.Rusi stated that, some time back, I was consulted by the drug producers of analgin- based drug. For year analgin-based drugs were advertised as a remedy for headache. To expand sales, the industry had two possible avenues open in it. Either to create condition for increase incidence of headache in the country or top changes the image of these drugs so that they would be used for general purpose also.

- Q1.which of two alternative would you prefer?
- Q2. Are these some other means to increase sale which Mr. Rusi has not sated?
- Q3. Explain the exceptional case of law of demand?

38. Case study

Rattan Sethi opened petrol – pump cum retail store retail store on Delhi – Agra highway about two- hour derive from Delhi. His store sells typical items needed by highway travelers like fast food , cold drink, chocolate, hot coffee, children’s toy, etc. he charge higher price compared to the sellers in Delhi, yet he is able to maintain brisk sale-particularly of “yours special pack” (YSP) consisting of soft drink in a disposable plastic bottle and a packet of light snacks. The highway travelers prefer to stop at his store because, while their cars wait for petrol-filling, they in the meantime can enjoy yours special pack (and, in some case would help themselves with some other items in the store). Each year he could substantially enhance his sales by providing special summer price on YSP which is almost half of its regular price.

Last year while returning from Delhi Ratan found that a new big and modern grocery shop has come up 15kms from Delhi on the national highway. It has affected his sales but only marginally. But last month another large store has opened just 5 kms away from his store.He knows that the challenges has come to his doorsteps and he expected to be adversely affected by the existence of these two stores. He needs to meet his challenges and decide to use the pricing strategy which has been using quiet effectively till recently. He now permanently reduce the price of YSP to half of its existing but at the end of the year Ratan find that his sales in general and of YSP is particular had declined by 20%.

- Q 1) Where has Ratan Sethi gone wrong? If he was a managerial economist how do you think he would have handled the situation.
- Q2. Explain the determinate of demand.
- Q3. Explain the arc and point elasticity measurement.

39.Case study

The new productivity strategies require that managers loosen control over employees (holding them accountable only for outcome), that they support rather than dominate employee efforts, and they proactively provided feedback, which may upset people. Productivity improvement also required increased measurement and communication of results. Managers may be sceptical that productivity improvement will help them rather than hurt them. To extent that managers use control- dominate- conflict avoidance to promote career, it is unreasonable to expect them to readily abandon these norms and related behaviors.

Mindlessness is a basic and frequent cause of resistance to productivity improvement. When mangers and employee are not fully aware of the condition that is necessary for success, productivity improvement often flounders. For example, managers ask their employee to conduct a survey of program clients but fail to provide adequate time, resources, and training for the survey to be conducted properly. The lack of appropriate condition gives rise to dissatisfaction and resistance. Obstacles occur that are not overcome. Mindlessness also causes complaints about insensitivity and authoritarian conduct. For example, managers often profess commitment to participatory decision-making process, but they are mindless when they fail to consider that subsequent autocratic decision making will generate resistance.

- Q1. Do you subscribe to the above- stated view?
- Q2. Does one often encounter such situation in organizations dictated by profit or nonprofit objective?

Q3. Is the above logic compatible with the theory of firm?

40. case study

Two companies, Burnwell and Safecook, have LPG refilling plants in a remote rural area. Due to its lower cost Burnwell is the prices leader and safecook the price follower. The cost function for Burnwell is $TC = 400 + 3Q - 0.00024Q^2$ (where $TC =$ total refilling cost, and $Q =$ no. of cylinders filled). The market demand curve for that area is estimated as $p = 8 - 0.0072Q$

Recently standard gas is considering entering this rural area. Till now SG had confined its operation to a metropolis, about 150kms. Away from this rural area. SG is a large firm and its variable cost is 25% less than the minimum average cost of Burnwell . But SG's disadvantage lies in its distance from market. Due to high transportation cost, SG; s delivered cost (which included production +transportation cost) would be 40% higher than is average variable cost. As a matter of policy, SG will enter the rural market only if it earns 25%over its delivered cost.

Q1. Will standard Gas entered the isolated rural market?

Q2. As a decision maker, what strategy do you think is the best for Burnwell?

Q3. Explain the types of cost.

Q4. Explain the meaning of monopoly, oligopoly.

41. Case study

Up to nine teen seventies three main studies were undertaken to estimate the efficiency loss due to monopoly in the United States. These were by Harberger in American Economic review (1954), Kamerschen in Western Economic Journal (1966) and Worcester, Jr. in Southern Economic Journal (1973). Harberger found that economic loss due to monopoly during 1924-28 was almost insignificant- about 0.1% of the US national income. His result was based on the assumption that the industries are subject to constant MC and unitary prices elasticity of demand. Stigler pointed out that the Harberger's analysis suffers from two major drawback: 1. The 'reported profits' used by him to identified monopolized industries are underestimates as not only the patent royalty etc. are disguised as cost but the intangible items are added to assets; and 2. Monopoly firm always produce in the elastic range and not in range where elasticity is unity. Kamerschen took note of Stigler's criticism of Harberger and while analyzing US monopoly included royalties, intangible, etc. in monopoly returns. Using the demand elasticity greater than unity, he found the welfare loss of US monopoly to the tune of 6% for the period 1956-61. The third study was done by Worcester Jr. for the period 1965-69, using the same kind of condition as proposed by Stigler and assuming demand elasticity of (-2) , he found the efficiency loss of monopoly as 0.5% of US national income.

Q1. Do you think that these studies were estimating efficiency loss through a theoretically sound formulation? Can you suggest some alternatives?

Q2. What will you infer regarding the effectiveness of government control if the estimate of efficiency loss of monopoly is (i) high or(ii) low.

Q3. Explain the meaning of pure monopoly and causes of origin of monopoly.

Q4. Differentiate between monopolistic and oligopoly.

42. Case study

An effect of recession in the conventional sector of U.S economy seem to be spilling over into the 'new economy' industries and sectors,. A pall of gloom has enveloped Silicon Valley that houses many cutting-edge (or 'bleeding edge' as they now say it) tech house. Indian techies, fallen to the ongoing recession in the valley, are either frantically disposing of their recently acquired homes and packing back home, or trying to desperately pick up an alternate job.

The Immigration and Naturalization service's rules stipulate that the person should leave the country in 10 days when they are out of 'status' (which means their visa is cancelled) .now that the companies have been told to declare

their layoff to the INS immediately. There are lots of 'open' house (up-for-sale-houses) in the valley and these houses seem to be on the market longer with lesser bids.

Many Indian, who bought a house while still on HI visa and have been laid off, are now trying hard to sell their house since they are not finding a job and do not want to pay exorbitant mortgage payment. Thanks to stock options (which reminded 'paper' money because of lock-in period, and produced many 'paper' millionaires), many had bought houses at ridiculously high prices. (A three- bedroom house in Any other city in the U.S will cost around \$300,000, but the same in the Bay area will cost \$700,000.) now the rentals have started dropping and the owners are fast losing money.

The dotcom burst and recession in the hi- tech industry have badly hurt visiting Indian software programmers in Silicon Valley and elsewhere in the country. The software expert who come in droves, mostly from the south of India, are in a dilemma- how to hang on till the recession is subdued or take the trip home. People on H-IB and those in the middle of getting a Green Card are the worst hit in this scenario.

Here are some reported layoff: telecom equipment maker Lucent Technologies is layoff 16,000 jobs: March first Inc announced its third round of layoff since Nov. 2000, letting go an additional 550 employees; Nortel Network announced a cut of 4,000 jobs over the next six month in the U.S and Canada. Amazon.com recently said it plan to layoff 15% of its employees (13, 00 workers. Some of the well-known dotcoms which have announced layoff are: Drkoop.com, eve.com, garden.com, food.com, mail.com and mypoint.com. .even the internet venture of well-known companies like Walt Disney or JP Morgan chase has run aground. Biggies like Casco, yahoo, Intel, and IBM have taken a beating.

- Q1. Does the above information imply the end of road for the dotcom and hi-tech industry in U.S.A?
- Q2. How does the venomous effect of recession spread across industries in U.S.A and into industries in India?
- Q3. Is there a way in which India can take advantage of its technical main power when U.S. industry is in recession?
- Q4. Explain the business cycle with the help of graph.

43. Case study

Sri Siddhartha Roy, an economist, Hindustan Lever Ltd. As estimate that if there is 1% increase in the prices of textiles, the demand for textiles would come down by 1.4%. Similarly, if the food prices go up by 1%, the demand for textiles would decline by 0.98%. Finally, if there is 1% increase in the share of agriculture in the national income, then the demand of the textiles would go up by .3%.

Price elasticity is an area where active intervention by the mills can contribute to the expansion of demand.

The margin in textile business as shown by NCAER and Anubhasis and Bijapukar study vary from 28% to 48% (this include margins of manufacturers, wholesalers, semi-wholesaler and retailer) .if the distribution system could be rationalized so as to bring down the final price of cloth, then by exploiting price elasticity alone, demand can go up.

- Q1. Explain the concept of price elasticity and its types.
- Q2. What role has been visualized for price- elasticity of demand for textiles in India?
- Q3. If price of cloth is reduced by 15%, how much will the demand increase?
- Q4. Identify the various types of demand elasticity relevant to textile demand in India.

44. Case study

As always, the movement in milk prices in India is determined by the quantity of milk supplied in the market and by the consumers; willingness to buy milk. Short- run seasonal factors and long-run decisions on the number and quality of herd size influence the milk supplied. At present, the India economy being in recession, consumers; income low and, therefore, low demand and market price of milk.

Supply of milk in the market is fairly predictable. During summer less milk is available for marketing, while during winters greater quantity milk is marketed. so the milk prices rise in summer and fall in winters every year. The reason for such variation in supply is mainly biological in nature. Some study on milk production has revealed that the seasonal variation in milk supply are also accompanied by significant economic milk cycle of a period of 15

years – 26 years. The economics milk cycle is a result of over- reaction of the milk supplier to both the upward and downward price signals. At present the India milk market is experiencing low supplies, high seasonal price, but is on the rising side of latest economic milk cycle.

Demand for milk has been found to be influenced mainly by the retail price of milk, tastes and the personal disposable income of the consumers. Low demand of milk in India is attributed mainly to the shift in consumer tastes (both in urban and rural sectors) and depressed consumers; income due to recession during 1977to 1983.

Now the economic indicators are suggesting an economic recovery. It is therefore, expected that milk prices will rise, which should serve as a signal for milk producer to augment their production capacity. it is expected that a 5% increase in consumers; disposable income result in 2% increase in the demand for milk.

In order to understand the effect of current recovery it is suggested to estimate and a compare milk prices under two alternative condition: (i) economic recovery during the current period: and (ii) zero economic growth, i.e continued recession. After a statistical analysis of data, it was found the personal disposable income of the consumers is likely to increase at most 3%rate. While in case of the second alternative it was assumed that the consumer expenditure would remain at the same level as last year. Forecast of monthly supplies of milk was arrived at for both alternatives. It was estimated that milk prices have gradually increased due to economic recovery and are 4 to 6% higher than if recession had continued. It is expected that as recovery picks up, the milk prices would further improve and are likely to go up further by around 10%during the current month next year . it is therefore, expected that the anticipated economic recovery will strengthen the market for milk producers in the country.

Q1. How far are the milk prices affected by (a) seasonal factors, (ii) cyclical factor (iii) other factor?

Q2. What is the measure of income elasticity of demand for retail price of milk?

Q3. Explain the types of price elasticity.

Consumer law example

Mr. George Tillman recently returned a leased car to GM. However, they charged him for not returning the service history and the manual with the car. Tillman is not willing to pay anything back to the company since he claims that he has not received any service history or manual from the supplier from whom the car was leased. Give legal advice to Tillman.

Case brief

A legal dispute between GM and George Tillman for not fulfilling the legal obligations under the lease agreement between the two.

Legal rationale

1. Under the lease agreement Tillman and GM, the former is liable to pay for any damage or loss caused to the property of the company.
2. However, Tillman claims that there has been no violation of law since he has not received any service history or manual from the supplier. He has a written proof of that.
3. Further, under consumer law, Tillman has a right to protect his consumer interests.

Legal advice

1. Tillman should write a letter to GM stating that he was unable to return the service history and car manual since he has not received them from the suppliers. Further, he has written proof of them.
2. He must also write to the supplier stating that if the case goes up to the court of law, then he is under law to implicate the supplier as the primary party responsible for the dispute.

Contract law example

A Seattle based Smartphone Company called HDC asked a software company SDC to develop software for them. The software company gave a total estimate of 10,000 dollars for a total work of 20 days. It was agreed between the two companies that HDC would be paying SDC 30 percent before the beginning of the work, 60 percent after the initial version and 10 percent on completion.

After 10 days, of work SDC wrote a letter that the work will take more time since their chief software developer has left the company. After 15 days SDC wrote back saying that they would be only able to deliver the source codes and would provide an assistant developer who will finish the rest of the work. After 20 days, when HDC asked for the final version, SDC told them that it can provide them with 80 percent of the work and would like the 60 percent as promised. However, fearing non-completion of the project, HDC cancelled the contract and asked for a full refund. SDC has threatened to take HDC to court for a breach of contract.

Case brief

HDC versus SDC due to an alleged breach of contract

Legal rationale

According to SDC there was a breach of contract but according to HDC, the software company did not deliver them what was promised.

Legal Advice

1. SDC should give HDC back all the money.

2. Otherwise, HDC can sue SDC.

MANAGEMENT SUP
MARKETING - COMMUNICATION

Marketing: 10 Case Studies

Case studies with solutions



Claire Garcia
Jean-Louis Martinez

DUNOD

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The case studies presented in this book have been written by students reading the “Marketing et Stratégies Commerciales” Masterdegree at the ESG Management School (2012), closely supervised by their professors. The amount of data provided has been considerably useful in the drafting of this book. We are grateful to these students.

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Foreword

Every day, business life involves making decisions based on evidence, which in turn allow the company (and all its employees) to move forward and make further decisions. This approach, known as a process chain, has implications for the long-term survival of a business. Such facts are compiled in a “company diagnosis”.

The concept of “diagnosis” can be explained simply: it is the production of knowledge based on observation of the actual and available facts. The available data is systematically analyzed in order to produce a coherent business strategy and to determine the means to implement this strategy at the practical and operational level. Such diagnoses are based on relevant factors: political, economic, socio-cultural, etc. However, they are necessarily conducted at a specific point in time and can therefore rapidly become outdated if the industry is dynamic. Further, these diagnoses usually rely on a set of facts (which are more or less accurate), opinions (more or less valid), and a certain bias of analysis (even if everything possible is done to limit this). Making a decision based on such a diagnosis alone may have important and unintended consequences for the future of a company.

A company diagnosis is a necessary component of any business strategy. Nevertheless its importance must be put into perspective. On one hand, economic systems are dynamic and situations can change rapidly, so the actors of these systems must continually adapt themselves to the new conditions and adjust their behaviour, needs and expectations accordingly. On the other hand, a manager cannot be sure that the chosen solution will be the best one, nor that the decision will be good.

Strategy is, by definition, a dynamic domain. A situation can be approached from multiple perspectives, and there is not always one sole solution to an issue faced by a company: numerous solutions may be possible, each having its own strengths, weaknesses, and efficiency. Thus, the diagnosis is just one element (among others) guiding the formation of a business strategy. This strategy aims to identify actions that, when implemented, will facilitate the resolution of actual problems. Finally, the decision-making process is the result of a discipline of mind, based on specific thinking processes and mechanisms.

It is in this context that the case study method becomes relevant. This method allows the reader, first, to train him or herself to analyse situations and environments, and secondly, to develop these thought processes so as to enable proposals for action in various areas of marketing, which together help to reduce the uncertainty faced by businesses.

The case studies examined in this book build on a diverse range of real life situations, and enable students to decide on action based on real information and data. A case can be focused on a specific issue (whether technical, human, financial, marketing, competitive, or industrial-related) but it is important to note at the outset that no issue is ever really isolated from the other aspects of a company, the situation of a company being the result of the overall balance (or imbalance) of all its services.

In practice, the data available in a case study will never be complete and sufficient. Also, not all information provided will necessarily be needed to resolve the case, but may be included so as to give a wider view of the company's context and its environment. Thus, the reader is encouraged to learn about the company and the relevant market to enable a comparison between the data provided and the data gathered and compiled, which will ensure the validity of the information and improve the decisions taken. As in any real-life situation, the proposals developed must always take into account the human context within which the firm operates. One must also bear in mind that, in business, there are no ideal decisions, only reasonable solutions!

The case study method aims, through real life examples, to generate open discussion among participants by providing a realistic illustration from the business world. The method requires intellectual rigour and discipline. It reverses the classic learning mechanisms taught at schools and universities. Whereas the latter approach relies on theory to derive practical applications, case studies require students to analyse and interpret the available data in order to decide which actions to implement. At a later point, the results may be generalized so as to apply to other situations; then links with theory, or new theories, may emerge.

This learning method should be used by teachers and lecturers as it enables students to capture better, and to analyse faster and more effectively, the problems involved in managing a business.

This method has two major advantages. First, active research and analysis by students enables them to acquire knowledge more easily and in greater detail than teaching methods based purely on theory; in the latter case students remain completely passive in the learning environment. Secondly, the analytical skills acquired and developed in the context of a real life business situation are far more important for making decisions than purely theoretical knowledge.

The case study method enables specifically to work on these two axes. Marketing is a complex yet fluid field: multiple factors must be taken into accounting any decision. Unfortunately, it may be difficult to quantify many of these factors, and this makes the case method particularly suitable for education in marketing. The case study method, more than any other, requires judgement and intellectual rigour, analytical and decision-making skills: all these are essential in the field of business.

This book presents ten company case studies, taken from various fields of business: the motor industry, the fast moving consumer goods (FMCG) industry (Netbooks, toys), specific sectors (sports, real estate), and the B to B industry. The studies illustrate the implications of analysing an environment, which will enable the identification of its most important elements, and thus the choice of a corporate strategy and finally of its implementation. The book is aimed at undergraduate and postgraduate students of business, marketing and strategy. The cases are designed to be accessible to beginners and others, involving concepts usually covered during the second or third year of a marketing or business degree. Those studying for business or professional degrees, or short courses such as BTS and DUT, will find this book useful when learning about the specific application of the case study method, which is a frequent feature of examination questions.

Each Chapter below follows the same structure. The case study is presented, describing the environment of the particular company, and providing all the data needed to identify the issue faced by the company. Additional information is provided in several appendices, giving a wider view of the company's context and environment. A set of exercises guides the reader, helping him or her to construct a solution, based on his or her analysis. The second part of each Chapter suggests answers: the exercises are reviewed one by one, and the most important elements for inclusion in the answers are cited, bearing in mind, as stated above, that several solutions are often possible. However, all the case studies start with analyses of the company's environment and the industry within which it operates, on one hand, and the company's skills and competences, on the other (external and internal analyses).

To conclude, we suggest a specific method for using this book and its contents. First, the reader should absorb the contents of the case study by reading carefully the first part of each Chapter: this will enable the identification of the salient facts and issues of the environment in question. The data and information provided should

next be classified, compared and synthesized (using tables, graphs, etc.) The student will then be able to complete the exercises suggested at the end of each case study: at this stage it is important to highlight those elements which help to resolve the issue at hand. Finally, a well structured case study report should be drafted: starting with a brief description of the company, identifying the main issues and potential associated issues, and presenting the results of the analysis. The most detailed section should be that which presents recommendations to the company, accompanied by comments and reasons. These suggestions should be critically discussed, justifying the final choice.

A Gentle Reminder: Best practice in writing up a case study report

Writing a case study report involves following a few rules. These are as follows:

- A case study report is not an essay: it is a call for action, to be read by the company's managers and executives. Thus, it is of the utmost importance to state immediately, in the introduction, the report's conclusion (the action to be considered). This will avoid lengthy argument and digression. The report should then set out the reasons for this recommendation, rather than being written in an "investigative" mode which only identifies the solution at its conclusion.
- A written report is a means of communication: to facilitate this, it should include a table of contents, page numbering, and all the other basic requirements of a properly formatted document.
- A case study report should follow the structure: "This is the main problem of the case study [...] The secondary problems are these [...] To solve these problems, this is what we recommend [...] and here are the reasons why [...]"

Finally, some pitfalls to avoid:

- A case study report should not simply paraphrase the text provided. Avoid at all costs rewriting the case word-for-word, or copying figures, tables or graphs already included in the case study.
- Recommendations should be clear and unambiguous, and supported by as much corroborative data as possible.
- The presentation style of a document is as important as its content: both elements affect the reader's perception of the analysis proposed. The report should be written in a simple, direct and concise style.
- Finally, subjective phrases such as "it seems", "I (we) believe", "in my (our) opinion", and "it is obvious that" should be avoided.

CASE

1

MPO Fenêtres

Case synopsis

Research problem

How to succeed in the PVC window market?

Case summary

This case study is based on real events which occurred in 2010. It describes the launch by MPO Fenêtres of new windows, characterised by improved thermal performance, achieved by the use of triple glazing.

This company is based in the French region of Orne. It has 200 employees, and realized a turnover of over €35 million in 2010. It has positioned itself as an innovative company, always seeking to apply the latest technical developments.

In the current economic crisis customers are more careful with their money, and think more carefully about potential purchases. In recent years it has been shown that consumers' purchasing behaviour has evolved, and that criteria such as sustainable development and environmental protection are now among the factors that may influence purchasing decisions. In this sense, an "ecological consciousness" has emerged. Not only the *Grenelle de l'Environnement* (a French forum for the discussion of issues relating to sustainable development) and government standards, but also tax credits associated with the purchase of certain goods, have affected the housing industry, and therefore also window manufacturers. Rebuilding and renovation are also subject to these factors.



In this context, the launch of windows made of PVC, with their high thermal performance and technical and competitive advantages, was important for this SME. It was the company managers' responsibility to launch and market these products successfully.

Learning objectives

This case study is designed to illustrate the practical application of the theoretical concepts covered during marketing and strategy lectures. Specifically, the case study focuses on marketing strategies.

Working on this case study will show the student how to:

- analyse a company's internal and external environment;
- identify the "key success factors" for a company operating in this industry;
- draft a sales pitch;
- decide on the size of the salesforce needed for a targeted commercial area;
- calculate a selling price;
- determine the feasibility of promotional offers, such as discounts.

Themes and tools used

- tools for analysing the business environment (SWOT, PESTEL);
- estimation and calculation of the operating margin;
- Human resources and hiring issues.

Target audience

This case study is suitable for new students of marketing and strategy: it enables the review of the fundamentals of market analysis, demonstrating the criteria used for strategic decision-making and for implementing a business strategy.

1 Introducing MPO Fenêtres

Founded in 1970 in Alençon (Orne), the company MPO Fenêtres (Menuiserie Plastique de l'Ouest) was one of the first French companies in the PVC/carpentry sector to offer a customized service. However, at that time, in France, very little was known about PVC, carpentry and double-glazing technology: these markets were still in their infancy. It took about ten years, and two oil crises (in 1974 and especially in 1979) for the PVC window market to really take off. The commercial policy of EDF (the French public energy provider) at that time favoured the development of this product, encouraging investors to push for “all electric” installations, which would, according to the manufacturer provider, require better insulation of public buildings to reduce heat loss.

Despite MPO Fenêtres's financial losses since the creation of the company in 1978, the managers decided to invest in new office and production buildings. From 1970 to 1997, MPO Fenêtres's products were rather basic. Two new product ranges were then offered by the company: a range of high quality windows made of aluminium and wood (1997) and windows featuring «+ super heat», with an improved insulation value, made of aluminum with a thermal break (2007). These additions to its product range were introduced in line with the company's desire to widen its target market. These two new product categories now account for 10% of the company's turnover.

MPO Fenêtres initially specialized in public and collective markets (professional/major accounts, government, schools, municipalities and other communities). However, from 1995 onwards it developed its sales to individual consumers. The public market today accounts for about 60% of the company's turnover, while the (still growing) consumers' market accounts for the remaining 40%. There are 200 employees working for the company, and turnover is over €35 million (*source: Internal figures 2010*). Significant growth has occurred over the last decade.

The company is constantly on the lookout for technical and technological innovations, both of which are well represented in its range of low thermal coefficient products. Further the high requirements of the company in terms of the quality of materials, assembly, and installation exceed the market standard. This allows the company to offer its customers products at the forefront of innovation, a key success factor in this industry. Incidentally, this is one of the four founding values of the company, together with perfectionism (the aim to do the best possible job), cheerfulness within the company, and honesty with all company's stakeholders (both employees and customers).

The French carpentry market, and more specifically the market for windows, has undergone several phases in recent years. We review these below.

2 Market figures: 2010

A survey conducted by the UFME (Union des Fabricants de Menuiseries Extérieures, July 2011) among stakeholders (designers, window manufacturers, outlets and installers) reveals the following.

In 2010, the French window market suffered a decline of 4% compared to 2009 with a value of about €9 billion (€5 billion relating to installation). The market was at its historical highest in the year 2005-2006, with 12.3 million windows sold, following a steady increase in the global market of about 4% per year between 2000 and 2006.

The overall volume of sales in 2010 shows that more than 11 billion windows (excluding opening glazed facades, shutters and doors) were sold. Among these, only 5% were imported: this is because the carpentry sector remained unaffected by the massive industrial relocations occurring in recent years. Local production is an important factor: most consumers prefer to buy from local companies and artisans. Almost all components of windows sold in France are produced in the European Community. Indeed, as consumer preferences vary greatly from one country to another, it is very difficult to market a standard product globally, which partly explains the customisation this phenomenon. In addition, over 90% of windows are custom made, which further limits the importation of materials.

The housing sector, and more specifically the sector relating to windows and shutters, employed 110,000 people in France in 2010. A third of this market value is linked directly to the jobs created (€3.25 billion over 10 billion for the housing sector overall). The market is mainly based on SMEs (around 5,000) who manufacture the windows, and artisans (around 40,000) who install them.

Two major markets exist for windows: windows in new buildings account for 26% of market volume, while replacement windows represent the remaining 74% (source: UFME, 2011). In terms of market value, the renovation market is larger, and generates more income.

Important price fluctuations can be observed on the market. The average price of a window is €420 (net of tax). However, as soon as the cost of installation is added, the price can rise by at least 80%, to €760. Since 2004, the average price of a window has increased by 38%. Several factors explain this, including the quality and type of material used: the market has shift towards aluminium on one hand, and towards more efficient products on the other hand. However, in terms of the volume of products sold, PVC largely dominates the market, with 62% of market share, followed by aluminium (22%) and wood (13%). However, looking at value estimates, aluminium accounts for 33% of market value and PVC for 49%. Nevertheless, the distribution and installation costs are declining, which, in a highly competitive mar-

ket, offsets the rising costs of the commodities and materials used in the manufacturing process.

The research institute Xerfi forecast two major changes in this market by 2011. Its first prediction was accelerated growth in the renovation market, reinforcing its importance. As a result of rising energy prices, individuals will be more likely to invest in better insulating materials for their houses in order to reduce their energy bills. Its second prediction was a sharp rise (expected to be a long-term trend) in new building, accounting for a third of the construction market.

Given the likely future development of the market, there are plenty of opportunities for window manufacturers, including a greater focus on customization. However, it is important to note that most of these new products linked to innovations will be linked to improved technical attributes of these products. This does not allow further development toward the consumers' market. It also protects companies from enjoying a share of the activity of the do It Yourself market segment. The largest distributor of joinery products in France is Lapeyre (a subsidiary of Saint-Gobain), one of the largest producers, processors and distributors of materials in France. Yet this operator represents only 10% of the market. The market report by Xerfi identifies other actors on the market:

1. **Specialists in manufacture**, marketing their products primarily business to business (B2B) but invest small amounts in niche markets, due to higher profitability expectations.
2. **Independent joinery networks** (including MPO Fenêtres) usually suffer from a lack of recognition and limited geographical coverage.
3. **The DIY and unskilled distribution networks**. These actors (such as Leroy Merlin), which have become essential market windows, now offer a comprehensive range of joinery (doors, windows, etc.) and benefit from their vast distribution networks to offer promotions.
4. Finally, a new type of actor has recently emerged on the market: **Online sale specialists** (such as Fenêtre24, Brico-Fenêtre). These target individual customers with specific building or DIY knowledge.

Most of these companies use a business and development model based on franchising (to promote rapid development of their distribution network) and aim their products at middlemen or independent artisans. Of these, the company which enjoys the greatest level of customer awareness is FPEE and its associated distribution network, *Art & Fenêtres*. Sales of windows are governed by a set of strict regulations and legislation. For instance, government initiatives and statutes promote the acquisition or replacement of windows by individual home-owners. Some of the relevant regulations are detailed in the next section.

3 The statute on thermal regulation

Since 1975, the statute on thermal regulation has imposed rules on French companies regarding the energy consumption of buildings. Since its inception, the aim has been to reduce energy consumption by 15 to 20% every five years.

The Thermal Regulation of 2012 (“RT 2012”) has been in force since July 2011 for the tertiary sector and public buildings, and from 1 January 2013 for residential houses. It is intended to promote better building design so as to reduce overall energy consumption and the need for heating. In 2012 these statutory requirements were increased, requiring contractors to increase their efforts to reduce the energy consumption of buildings. The main objective is to achieve self-sufficiency for energy purposes in buildings by 2020. Thus, this regulation promotes the use of more efficient technologies for the production and retention of heat, as well as the production of renewable energy.

Many standards apply to the design of buildings, including windows and doors.

The new ISO 23045: 2008 establishes specific guidelines applicable to the design of buildings, to improve energy efficiency. To this end, the ISO covers the choice of the raw materials and components used, the location of the building, and the energy sources used. In theory, the ISO enables the transmission and sharing of information about a building’s energy efficiency by standardizing its energy statement. It also defines objectives specific to each construction project from the design stage onwards (source: ISO Standards habitat).

In addition, companies use independent inspection and certification to prove the increased performance of their products, and to act as a guarantee of their quality. Thus, the NF and CSTB labels ensure compliance for window manufacture, with minimum levels of quality and standards concerning air – and water-tightness, and wind resistance. Such certification of PVC joinery allows consumers to assess manufacturing quality with respect to those three factors.

Finally, in response to the growing concerns of both individuals and institutions about global warming, the “Grenelle Environment Forum”, organized in 2007 by the Fillon government, brought together for the first time the State and the representatives of civil society to define a roadmap for Ecology, Development and Sustainable Planning (source: Presentation by the Grenelle, October 2010). The Grenelle has achieved some progress by promoting the involvement of all stakeholders. In terms of development and planning, the Grenelle’s objectives are to: «promote efficient urban land resources, energy and implement technological breakthrough in thermal improvement renovation and accelerate the renovation of the old fleet” (source: Grenelle Environment Forum, “Building rises to the challenge”, October 2010). Following discussions, two key measures were implemented.

The first was the introduction of interest-free loans for qualifying energy-efficient building projects, from early April 2009. Such loans are available for house renovation work to reduce both energy consumption and the emission of greenhouse gases. The loan is granted for certain types of work (such as project management and energy consumption assessments, insurance fees, etc.) or for any work involved in and inseparable from energy efficiency improvements and installation carried out by a professional. This latter category includes the installation of new windows, including triple-glazed windows. Specific conditions must be met to qualify for such a loan (concerning the age of the house, the grant of any previous loan, the amount of the loan, repayment schedule, etc.) These loans rapidly became popular: by late July 2009, 15,000 applications had been received, and by the end of March 2010, more than 100,000 loans had been granted.

The second measure introduced were training schemes for companies and craftsmen, to encourage them to take into account the energy performance of buildings. Since its launch in 2008, over 10,000 workers have been trained under this measure.

Following this market trend, MPO Fenêtres has obtained certification, allowing the company to showcase its commitment to sustainable development, from product design through to its installation. MPO Fenêtres highlights its long-term commitment by ensuring that the joinery products it sells are environmentally-friendly. MPO Fenêtres maintains its commitment to the continuous improvement of its products, including products with triple glazing, which allow an increase in performance of over 40% compared to the best double-glazing on the market. This commitment is reflected in all companies' activities, as stated above, but MPO Fenêtres has also improved its installation and waste treatment along ecological lines, including waste recycling.

In other words, since 1 March 2007, MPO Fenêtres has committed itself to producing more eco friendly windows, offering NFcstBat-certified eco friendly windows and triple-glazed Visio windows. As such, MPO Fenêtres puts the most efficient windows in terms of thermal insulation within reach of everyone. The company decided to concentrate on this market sector, which, according to the company's CEO, represents the future of the company. Noting that for an average surface area of 50 to 100 m², 10 to 15% of heat loss from dwellings comes from windows, it appears that they are an important element that could improve the overall energy performance of homes. Indeed, these windows have become the ideal solution in terms of domestic thermal insulation.

The three panes which make up the triple glazing are separated by spaces filled with gas, giving them excellent thermal performance. Triple glazing captures very little heat. It therefore gives very good thermal insulation and ensures low heat loss, saving energy by reducing the amount of heating needed in winter and of cooling in

summer. However, triple glazing products are much more expensive to purchase, and the acoustic insulation offered is not necessarily better than that of “acoustic double glazing”. Therefore, the company needs to ensure the best promotion in order to convince clients to invest in these products.

Many consumers are willing to spend large sums on products which produce immediate benefits. Expenditure on housing (including joinery) often involves substantial outlay, from which the expected savings are less obvious to individuals. Yet such investment is an effective way to reduce energy costs significantly. Thus, the company’s marketing should focus on the potential savings in energy costs for homeowners over the long term.

In order to support sales, MPO Fenêtres has developed products within the framework of sustainable development, from design to installation. Additional certification for the installation of windows obtained in 2011 is further evidence of the company’s desire to provide a quality service. These certificates and service evaluations conducted by independent arbiters are highlighted by the company’s sales staff in discussions with existing and potential customers. The sales force is therefore a very important element of the new marketing strategy and the launch of the triple-glazed windows.

4 Marketing and distribution strategies

With regard to marketing and distribution, the business is customer-oriented: therefore MPO Fenêtres has chosen to keep control of the entire supply chain, right through from the order to delivery to (and sometimes installation for) the customer.

For both new and replacement windows, MPO Fenêtres markets, designs, manufactures and installs its own products, thus ensuring complete control of the order and keeping to a minimum the number of contacts for the customer.

The company distributes its products through two distribution channels: a central department in charge of “key accounts” and “communities”, and a network of eight agencies deployed in northeastern France, all owned by the company. These agencies are the cornerstone of the distribution network. Each agency employs fifteen salespersons, as the control of about 15% of its market area, and operates in a sales territory of approximately 45,000 customers. The company’s salespeople actively seek potential clients, especially at trade fairs and exhibitions. These events are of paramount importance: they afford opportunities to expand the client base and win new contracts. Up to 25% of the annual turnover of an agency can be attributed to contacts made during these events.

Today, the continuing strong growth of the market has encouraged MPO Fenêtres's CEO to rethink the organisational model of its agencies. In order to improve performance and increase the commercial strength of the company, an audit of its business performance was conducted. Internal research within the company enabled the identification of tasks conducted by employees, and the time allocated to each task, over the course a year. The results are as follows.

Each year, a salesperson has two weeks of training and five weeks of paid holidays (in accordance with employment law). Two weeks of their annual working time is devoted to attending trade fairs. In addition, the average salesperson is absent one week per year for personal reasons. In terms of the organization of their five-day working week, the Director observed that one day is devoted to purely administrative tasks (making appointments and reporting activities). For the remaining four days of the week, based on a working day of 11 hours, one hour is devoted to the management of administrative problems and urgent tasks, and one hour is taken as a lunch break. In terms of customer contacts, information obtained from sales staff showed that the average sale is concluded at the end of the third meeting, and that such meetings last on average about an hour.

Convinced that high thermal performance PVC windows are the future of the company, the company's directorate decided to develop sales of these as its primary strategic activity. It therefore needed to develop a marketing strategy for these products on the retail market. Some factors are key to the strategic approach needed: individuals are not necessarily aware of the technical features of the products. In addition, although they offer real benefits, triple-glazed products are more expensive. This may hinder sales of triple-glazed products, because many alternatives, which are cheaper and perform equally well, are still marketed, both in the company's own catalogue and in those of its competitors. Although the triple-glazed products are better in terms of insulation and sophistication, their price may be an important deterrent.

Questions

- 1 ■ Conduct an internal and an external diagnosis of the company. Use the SWOT tool to synthesize this information.
- 2 ■ Identify the Key Factors for Success from the diagnosis.
- 3 ■ Write a sales pitch for the company. Prepare sales claims to be presented to sellers. Remember to take into account the potential objections of customers: provide the employees with arguments to counter customers' misconceptions.
- 4 ■ Suggest incentives to stimulate the sales force (bonuses, collective or individual incentives, etc.) to encourage their continued training and to support sales of this product.
- 5 ■ Determine the optimum size of a business team for an agency, using the information provided in the case study. Consider the effectiveness of an agency's sales team and the commercial influence that the agency can exercise in its area of operation.
- 6 ■ Assess the feasibility of a commercial promotion offering "triple-glazed windows for the price of double glazing" for the product launch.

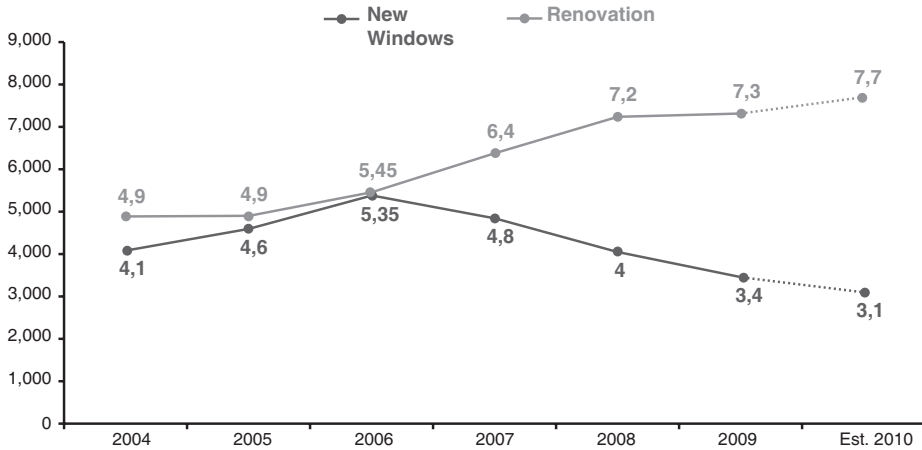
APPENDIX 1 – The market context

Over recent years, the market has grown steadily, but different forecasts by professionals are more pessimistic (see Figure: Potential market developments for windows in France established by TBC). Indeed, production had increased to meet the increase in demand (see graph: market developments in France between 2004 and 2008). According to a survey by TBC (2009), the new construction market appears to be the most adversely affected (57% of those surveyed predicted a decline in the installation of windows) while fewer installations of replacement windows was predicted by 29% of professionals. It appears that market participants will have to respond to these new market conditions, either by offering lower prices or better services, or by improving production levels.

A second cause for concern in the joinery market is rising energy prices. The price of energy has been increasing for several years.

Electricity costs increased by 5% in 2011, following significant increases in previous years. While gas appeared until recently to be a cheaper alternative, this is no longer the case: gas prices increased by 20% between 2010 and 2011. What might have appeared to be temporary fluctuations in market prices now seem to have become a settled trend which is unlikely to change. Indeed, a Senate report in July 2012 states that the average electricity bill for a French household could increase by 50% by 2020, due to increasingly high investment in renewable and nuclear energy (*Le Monde*, 19 July 2012). Rising energy costs will have a positive impact

on market activities related to the insulation and improvement market in construction (because improved insulation produces energy savings).



Sources: TBC quantitative surveys in 2004, 2006 and 2008.

Evolution of the window market in France from 2004 to 2010

Consumers who see their energy bills increasing ever faster will look for means to reduce this cost. The cost of inaction with regards to energy is becoming greater than investing in new materials. In the current financial crisis, faced with both price increases and decreasing purchasing power, the financial resources of households are declining. Suppliers of the various types of products which enable energy savings may therefore find themselves in direct competition (wall insulation, renewable energy equipment, etc.).

APPENDIX 2 – PVC and the environment, recycling

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Polyvinyl chloride (or PVC) is one of the most popular materials for joinery products, and is now widely used because it has a long life. It is used in more than 50% of joinery products with a life of over fifteen years. It is composed of 43% ethylene (derived from crude oil) and 57% chlorine. PVC products are used in many sectors, including public health, industry, construction, and sustainable structures in the automotive industry.

In addition, PVC has a positive image in terms of environmental protection. Scientific studies comparing the impact of different materials on the environment found that PVC had no significant negative impact on the environment compared with alternative materials. In its intrinsic strength, weather resistance, and its eligibility for recycling, PVC is a material that appears to offer all the necessary benefits.

However, there is scope for improvement in relation to PVC recycling. Today, waste PVC is collected by the industry through specific programmes that can recycle it. Manufacturers in this industry do not yet meet their voluntary commitments to incorporate more recycled material in their finished products because there is not yet enough material to recycle.

MIS Case Studies

Case 1

SystemX Inc. Withdraws Rs. 1 Billion SoftGuide Acquisition Offer

The following is an excerpt from a news article in the *Daily Update*, March 07, 2010

“SystemX Inc., called off its acquisition of SoftGuide Knowledge Consultants, Friday, saying that 1 Billion was too high a price.” (SoftGuide has a considerable market share in Training and Development services and would therefore help SystemX to diversify and expand its range of services to customers.)

“Although SystemX officials would not comment further, several observers said that problems discovered at SoftGuide probably lay behind the decision.... The article said that SystemX feared that SoftGuide’s data-processing system was inadequate to handle the new products planned for the SoftGuide sales staff. SystemX officials were also concerned about the 30 percent annual turnover among sales personnel... Tabrez A., SoftGuide CEO, responded that the SoftGuide’s data-processing was quite competent and has absorbed at least one new product a month for two years.”

Questions:

- a. Why should SystemX be so concerned about the capabilities of SoftGuide’s data-processing?
- b. What competitive advantages to a Training and Consultancy services company may be provided by an information system?

Case 2

Professor Challenges Basic Assumption about Planning and Control

Professor A. Van Cauwenbergh of Antwerp University, in a paper presented at the Tenth Anniversary Conference of the European Institute for Advanced Studies in Management, presented four revisions to traditional Management Theory. In summary, the revisions are:

- (1) The initiative for the renewal and adjustment of the activities of a firm should come from the different levels in the management hierarchy. “Strategy is not a privilege of top management”.
- (2) Firms, especially big firms, are incoherent systems (goals of the different component systems are not simply subdivisions of an overall goal; there are individual, conflicting goals as well). Some of these differences are manifestations of organizational initiative and vitality. Using information systems and central planning and rule making to suppress all differences is destructive to organizations.
- (3) The most vital “fluid” of an enterprise is the aggregate of its entrepreneurial values. The most fundamental and motivation and control come through these shared values relative to work, quality, efficiency, etc. Management often neglects these values and assumes that the collection and dissemination of information will provide sufficient motivation and control.
- (4) Enterprises are open systems; their structure and operating processes are determined by their environment. This means organizations must be designed to continually adjust to the environment.

Questions:

- a. If these revisions are correct, how is planning to be organized? How should the information system support the planning organization?
- b. Can the information system aid in achieving shared values?
- c. How might a comprehensive system be used to stifle initiative?

Case 3
Ten Guidelines for Strategic MIS Planning

Robert V. Head, a consultant on MIS planning, provided ten guidelines to help MIS executives who are on the threshold of experimenting with strategic MIS planning:

1. Make provisions in the systems plan for taking small steps rapidly. "Don't have a plan with goals extending so far into the future that there is no way of tracking it."
2. Develop alternative plans when significant contradictory trends are discerned in business objectives or technology.
3. Interface the systems plan with the corporate plan, modifying both appropriately.
4. Document the systems plan in a format intelligible to top management and arrange for personal presentation.
5. Establish a formal mechanism for review and reiteration of the systems plan.
6. Develop a system for tabulating and forecasting utilization of installed data processing (DP) equipment.
7. Fix the organizational responsibility for systems planning.
8. Rotate the assignment of technical personnel to the planning staff in order to avoid an "ivory tower aura."
9. Budget for research and development.
10. Set up a comparative systems intelligence activity.

Questions:

- a. What can be the drawback of having a formal system as mentioned in point 5?
- b. Can transparency make organizational responsibility more effective?

Case 4
Unraveling the Jargon

The consultant's reply was: "In my investigation of your applications portfolios, I've applied ... to the logical data structures and have discovered a very high frequency – approximately 93.286% - of data embedded in application program logic which is largely responsible for the integrity and synchronization problem currently being encountered. As a solution, I would recommend the design of a master database each of which would employ relational technology to reduce the database to third normal form. This would eliminate the possibility of semantic disintegrity upon querying the database."

Questions:

- a. Try to guess what the consultant said?
- b. Justify the use of technical jargon.

Case 5 Information System in Restaurant

A waiter takes an order at a table, and then enters it online via one of the six terminals located in the restaurant dining room. The order is routed to a printer in the appropriate preparation area: the cold-item printer if it is a *salad*, the hot-item printer if it is a hot *sandwich* or the bar printer if it is a *drink*. A customer's meal check-listing (bill) the items ordered and the respective prices are automatically generated. This ordering system eliminates the old three-carbon-copy guest check system as well as any problems caused by a waiter's handwriting. When the kitchen runs out of a food item, the cooks send out an 'out of stock' message, which will be displayed on the dining room terminals when waiters try to order that item. This gives the waiters faster feedback, enabling them to give better service to the customers.

Other system features aid management in the planning and control of their restaurant business. The system provides up-to-the-minute information on the food items ordered and breaks out percentages showing sales of each item versus total sales. This helps management plan menus according to customers' tastes. The system also compares the weekly sales totals versus food costs, allowing planning for tighter cost controls. In addition, whenever an order is voided, the reasons for the void are keyed in. This may help later in management decisions, especially if the voids consistently related to food or service.

Acceptance of the system by the users is exceptionally high since the waiters and waitresses were involved in the selection and design process. All potential users were asked to give their impressions and ideas about the various systems available before one was chosen.

Questions:

- a. In the light of the system, describe the decisions to be made in the area of strategic planning, managerial control and operational control? What information would you require to make such decisions?
- b. What would make the system a more complete MIS rather than just doing transaction processing?
- c. Explain the probable effects that making the system more formal would have on the customers and the management.

Case 6 Security Loopholes

Utpal had just joined SystemX as Systems Manager. But he was a worried man looking at the current state of affairs at SystemX. As a part of assessing hardware and software requirements, it was found that out of the 364 desktops at the corporate office; more than half did not have their anti-virus software updated with recent virus signature files. Three - fourths had not changed the default e-mail password (it was the user name) and no one had installed OS patches. And one of its local mail servers seemed to be an open relay! For a fleeting moment, he wondered about the situation at the seven branch offices across the country.

SystemX used the Net extensively in dealing with its branches, customers and suppliers. Information like contract documents, marketing plans, Cheque and Draft numbers, bank account details and collection details were regularly transmitted by e-mail. Utpal's first thought was that he would recommend that SystemX bring in a security consultant. But the budget constraints meant that his recommendation was unlikely to find favour. He was beginning to feel a bit out of depth and was wondering what he should do to ensure that SystemX's data remained safe and secure.

Questions:

- a. What security loopholes come to the fore in the situation described? How can these be plugged?
- b. What is the importance of a "security budget" in the context of the given situation?

Case 7 Web Portal Benefits

At Du Pont Co.'s (www.dupont.com) \$4 billion performance coating grope, the critical issue was content management. "We have a very large number of documents for marketing: brochures, press releases, warranty information on products and general support content for our distributors and car repair body shops", explains Catherine March and, the groups e- business strategy manager. "Our salesmen were driving around with 23 kg of obsolete literature in their trunk."

Du Pont opted to deliver the information through a web-based intranet/ extranet portal, using technology from Bow-street, a portal s/w and web development tools company. Du Pont wanted the ability to customize information about its half a dozen coating brands. It also wanted each of its 2500 distributors and repair shops worldwide to see the information displayed in almost 4000 different site views; which the technology would allow it to do.

Since the content capability was initiated, Du Pont's site has grown rapidly. The body shops can now get training, bench marketing tools, and can paint colour formulas via the portal. There are also job-posting and resume services. And for the distributors, Du Pont is researching adding order-tracking and order accuracy capabilities soon.

Questions:

- a. What are the business benefits of the web portal? Make a critical assessment.
- b. What is the importance of 'content management' for enterprise web portals?
- c. Can a small business develop and maintain such a portal?

Case 8 Building the IT Infrastructure

Alfred is a do-it-yourself entrepreneur who built up his fortune in trading. He traded in anything and everything, and kept close control of every activity. That was how he had grown rich enough to indulge in his one dream — to build a college in his hometown. A college that would be at par to the ones in the better cities, the ones in which he could not study himself.

Work started a year back and the buildings were coming along well. He himself did not use computers much and became hooked to the Internet and e-mail only recently. He was determined to provide a PC with Internet connectivity to every students and faculty member. He was currently engrossed in plans for the 100 - seater computer lab.

What was confusing him was the choice of Internet connectivity. He had about a dozen quotes in front of him. Recommendations ranged from 64 kbps ISDN all the way to 1 Gbps leased line to Guwahati, which was almost 200 km away. Prices ranged from slightly under a lakh all the way up to Rs 25 lakh and beyond. He did not understand most of the equipment quoted — firewall, proxy server, cache appliance. Nor was he sure what the hidden costs were. Although it went against his very nature, he would have to identify a trustworthy consultant who would help him make sense of the whole thing.

Questions:

- a. In the context of the given case, what managerial issues need to be addressed by Alfred? Why is it important for managers to be *tech savvy*?
- b. What is the importance of a 'systems consultant' to an organization? What skills should he/she possess?

Case 9
IT Strategies

Having spent considerable time paring back staff, consolidating servers and storage equipment, rendering servers and storage equipment, renegotiating vendor contracts, and conducting selective outsourcing, CIOs are struggling to find new ways to reduce costs while still developing and implementing the new or improved business systems their companies need. In their quest to come up with even more ways to keep lid on costs, dauntless IT leaders are exploring everything from barter agreements with vendors to reselling services and joining purchasing consortiums for volume price discounts on equipment. At amazon.com, CIO Rick Dalzell followed the following strategies:

- Embrace open source
- Recognize when you have to spend to save
- Help your partners help you
- Use a tight budget as an excuse to get creative

Questions:

- a. What are the business benefits and limitations of Rick Dalzell's strategies?
- b. Why are business houses finding it difficult to keep costs down in spite of the fact that technology is getting cheaper?

Case 10
Overhauling the Information Systems Environment

Multibase Company Limited is a diversified business group with interests in fabric and yarn manufacturing, paper and pulp, and cement. Its manufacturing units are located across the country and number eight- one for fabric, two for yarn, two for paper and pulp, and three for cement. While the head of each unit has considerable operational autonomy, strategic decisions considering these units, such as capacity expansion, procurement of new technology involving substantial investment, etc., are made at the headquarters, located in Delhi. The head quarters monitor the performance of every unit though weekly and monthly reports are which are prepared by CBIS installed at each unit. Often considerable amount of time of the senior executives based at the headquarters is taken away in analyzing these reports and drawing inferences for planning and control. The result is that the senior executives have little time for strategic thinking which they feel is a must in the present competitive environment. The CEO of the company has thus proposed to develop suitable computer based systems which might be helpful in understanding the current status of various manufacturing units in terms of their overall performance, the type of environmental constraints that operate in the three business that exist for enhancing capacity in these business areas.

Questions:

- a. What systems would you propose that would serve the company's needs?
- b. Considering that the company already has CBIS installed, will you contemplate complete overhaul of the systems or add functionalities of the existing systems? Justify your line of action.
- c. Justify the requirement of a Chief Information Officer (CIO) in the context of the given caselet.

Case 11
Reaching Out

Rosenbluth, a privately held, family owned company, is the second largest travel services firm in the world, with American Express being number one. Rosebluth's Global Distribution Network (GDN) is a worldwide telecommunications network through which the airline reservation systems are accessible. All Rosenbluth agents are connected to GDN as most of the company's travel software applications. Client's planning trips can either use the network to research or book their travel arrangements, or they can work through a Rosebluth agent. Moreover, clients can choose to use a local Rosenbluth agent, or they can turn to specific agents of their choice anywhere in the world.

Hal Rosenbluth of the company had this to say, "...Now we will not only connect people by planes or trains but we will connect them through technology."

Questions:

- a. How has technology helped companies like Rosenbluth deliver customized services?
- b. Is it possible for small companies to adopt technology similar to Rosenbluth's? Why or why not? Justify.
- c. What is the significance of Rosenbluth's statement? Give your viewpoint.

Case 12
System Failure!

Read the following news snippets:

- On 20 November, 1985, the Bank of New York lost over \$ 5 million as a result of an error in the software of the digital system that registered all the bank's financial transactions.
- In 1992, a software problem created total chaos in the communication system of ambulance services in London. The delay in communications caused the death of 30 people.
- On 7 August, 1996, the computer system of Internet-provider America Online (AOL) failed for 19 hours when new software had been installed. Over 16 million subscribers were affected. Before this took place, the AOL experts had strongly suggested that the system was immune to this kind of disaster.

Questions:

- a. Is it justified to say that digital systems are unreliable and carries enormous risks?
- b. What countermeasures should be put in place to minimize damages due to failure of digital systems? Give your answer for each of the above three situations.

Case 13
IT in the Construction Industry

Many people think that the most widely used tool in a construction project is the hammer, but it's probably a filing cabinet or fax machine. The \$ 3.4 trillion US construction industry is highly paper intensive. A complex project such as a large building requires the coordination of many different groups and hundreds of architectural drawings and design documents, which can change daily. Costly delays because of misplaced documents could make or break a company in an industry with razor-thin profit margins of 1 to 2 percent.

Web technology is starting to address this problem. New web-based construction project management systems enable project managers to exchange documents and work online wherever they are using web browser software. Auto Desk Building Corporation Services, for example, offers customers a shared central space where project managers can exchange documents with engineers and architects, track scheduling and performance, and hold online meetings.

Questions:

- a. What are the management benefits of using web-based construction management software?
- b. How can the systems as mentioned be used to share knowledge and experiences for better management of projects and tasks at hand?
- c. What problems might be associated with such web-based systems? How can those problems be tackled?

Case 14
Too Many Information Systems!

X University has of late expanded very rapidly introducing a number of programmes and increasing student intake capacity. It has recently computerized its examination process based on some off-the-shelf software. The library had already been computerized a couple of years back using a freely distributed Library Automation System. Daily cash transactions are also handled by computers in the Finance and Accounting Division, using an accounting software. For further improvement of efficiency, the new governing body of the University have entrusted the task of developing an MIS for the University to a Software Company.

All these developments were welcomed by a cross-section of the University Community except a few. One of them is a faculty member at the Management Science Department who commented that the University is burdening itself with too many independent information systems. He strongly favoured an integrated information system on the lines of an ERP for a business organization.

Questions:

- a. Do you agree with the faculty member? Give reasons.
- b. What do you understand by Integrated Information System, the faculty member is talking about? Elaborate in the context of the X University.
- c. Visualise that the University governing Body decides to drop the MIS plan and agrees to the idea of developing an integrated IS. What problems are likely to creep in?
- d. Assess the role of Information System specialists and consultants in situations as described in the caselet.

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SAMPLE CASE STUDIES – MARKETING

Case Study 1

Marketing and Distribution of Mushroom

Sachin and Virag are two enterprising youth. They have passed out from IIM, Bangalore. They thought instead of doing a job, they will launch fresh vegetables in Indian markets. Having learnt of the future conventional foods, they decided to venture into cultivation of mushrooms.

Mushrooms are known to be the best alternative food for vegetarians. For Sachin and Virag fund raising was a serious handicap for mass production. However, the first trial batch of mushrooms that they produced was bought by Star Hotel in Bangalore. Further, the hotel placed orders for supply of 20 kgs every day.

Now mushroom industry is run by small entrepreneurs, like Sachin and Virag. Another big player M/s Ashtavinayak Mushrooms, equipped with cold storage facility was more interested in the export market.

Sachin and Virag have set their sights high. They aim to sell mushrooms in a very big way all over India. Mushrooms have a great market potential and is a perishable food.

Questions

- A. How will you advise Sachin and Virag, as how to increase the consumer awareness about this new food?
- B. What would be your suggestions for distribution channel for mushrooms?

Possible Solutions

A.

- Consumer awareness can be created by test marketing. Through sales persons and customer response to the product.
- Samples can be distributed in big malls and Variety stores.
- Awareness can also be created through outdoor publicity such as wall hoardings, banners, insertions *in news papers* etc.

Targeted Customers:

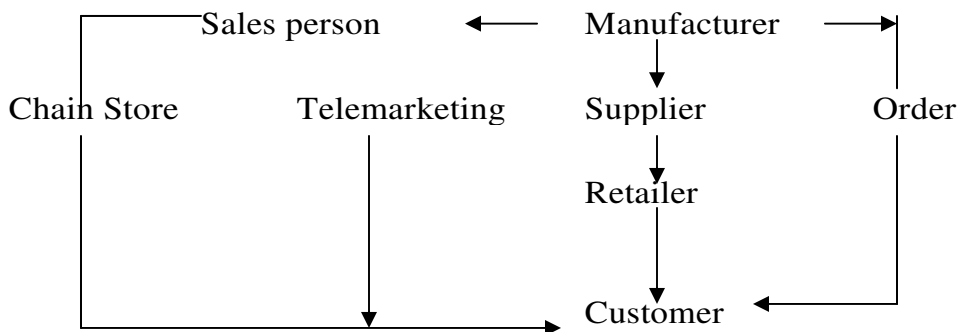
- * Hotels

- * Household sector
 - * Restaurants
 - * Industrial canteens
 - Brand name of the company along with the product can also be highlighted to the customer by using the concept of *event marketing*.
 - For different kinds of selling modes they can target different customers
- Institutional sale:** Hotel / Restaurants/Industrial canteens
- Individual sale:** Household
- Approach to hotel industry can be made and product benefit can be shown to convince the customer. Mushroom related recipe booklet can be given to them for use.
 - Can approach the T.V programs for Khana Khazana to show different recipes of Mushrooms in their shows.
 - Dealer push through sales promotion campaign.
 - Press meetings can be a way to consumer awareness. Editors, journalists of newspapers having maximum circulation can be contacted and samples to be distributed to them (such as 250 gm or 100 gm packs).
 - Packaging should be attractive.

B.

- Distribution network:**
- Product having being perishable, company should go for *faster and effective distribution network* having *cold storage facility*.
 - Distribution through company delivery vans in local market and distribution through rail or road transport to urban markets.

Network



Case Study 2

Indian Refrigerator Market

India's Refrigerator market estimated at Rs. 2750 Cr. is catered mainly by 10 brands. The annual capacity is estimated at around 4.15 million units is running head of demand of 1.5 millions.

As there is a demand and a surplus supply, all the manufacturers are trying out for new strategies in the market.

Times have changed and also the buying behaviour of the customer. Earlier it was cash and carry system. Now dealers play an important role in selling; now the systems is exchange for old “bring your old refrigerator and take a new one with many gifts”.

A new company by name Electrolux has entered the market which has acquired Allwyn, Kelvinator and Voltas brand.

Researchers have revealed that urban and city sales are declining and hence all manufacturers are trying to concentrate on rural markets.

Electrolux strategy is customisation of market, with special attention to the Northern and Southern India markets, while Godrej the main player thinks that dealer network in rural market for sales and service will be beneficial and is trying to give more emphasis on dealer network, whereas Whirlpool has adopted the strategy of increasing the dealer network by 30%.

The market shares of the major players are as follows:

- Godrej 30%
- Videocon 13%
- Kelvinator 12%
- Allwyn 10%
- Voltas 5%
- Whirlpool 27%
- Daewoo 1%
- L.G 1%
- Others 1%

Questions

1. Could the refrigerator market be segmented on geographical base planned by Electrolux?
2. What would be the marketing mix for rural market?
3. Would 125 L and 150 L models be an ideal choice to launch in rural market?

Possible Solutions

1. The main justification for Electrolux strategy would be Electrolux is amalgamation of 3 companies, Kelvinator, Voltas and Allwyn. Allwyn is popular in South Indian market, while Kelvinator is famous in North India Market. Electrolux wants to cash in on the popularity of the respective brands.

It is not possible to segment according to North or South Indian Market, once a company's name becomes a logo, then the reason for buying for customers for other brand depends upon price, quality, usability and features of the product.

The storage pattern of foods in North India and South India is same. Same is the case of rest of India, so it won't be possible to segregate the market according to the geographical base.

2. The rural market is small but significant as far as refrigerator is concerned. Moreover, the cost of selling of dealer in the rural market should also be justified.

The type of food the rural people consume should also be taken into account; they prefer to have more of natural foods and less of derived food products like Ice-creams, butter, cheese etc. The cost of the refrigerator should be less attractive to buy. The size and material should be so adjusted that the cost price would be reasonable. The capacity of the refrigerator should be 100 l - 300 l. Much more space has to be given for storing vegetables. Other important factor to be taken into consideration is the Power supply which is not so good in rural areas. To avoid the voltage fluctuations in built stabilisers will be the selling features in the rural areas.

3. The chances of selling of 125 l and 150 l refrigerators are high because the prices of the refrigerators would be less. This would be a major factor. The second aspect would be they don't have many items to store. They would prefer a small refrigerator, also the space in their homes are not very big wherein a small refrigerator would serve their needs.

Business System Support Case Study

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Introduction

Purpose

The process described in this document was originally compiled to aid in the implementation of business system support within a global manufacturing company, for use in ERP enhancement or upgrade, reporting suite, other application maintenance, and any other type of business system support, whether or not that work is formally considered to be a “project”.

The person responsible for re-engineering this process spent several months drawing up process documents which no-one used, and struggled even to understand, before turning to the techniques of Human Interaction Management, and finding that everything they had written so far, and more, could be expressed in a single 1-page diagram – further, a diagram that elucidated the processes concerned so clearly that all parties involved were able to agree on a re-engineered version within 2 meetings.

Scope

The document provides a single, simple diagram that shows all Roles involved in the process – these Roles are generic, whatever the type of project. Their interactions are shown as clear boxes. Their activities are shown as shaded boxes.

The notation used is a simplified and enhanced form of the standard process modelling technique known as Role Activity Diagramming.

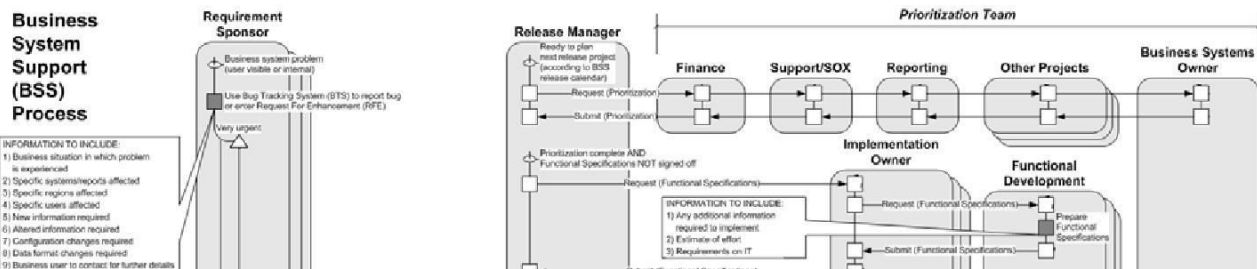
The process diagram is readable by anyone without training, and was used for publication on an internal company Web site for use by everyone within the teams concerned. However, the diagram is further illustrated and explained in this document via the use of example scenarios.

Structure

The document has 2 main sections:

- The process diagram
- Example scenarios.

Business System Support – Process Diagram



Example Scenarios

In this section we present some example scenarios: typical situations from business systems that illustrate the process shown above in action.

Urgent new requirement during release cycle

Let us suppose that a new business requirement has arisen. The Requirement Sponsor enters the requirement into the Bug Tracking System as usual, but the next release cycle has already been prioritized and planned – development is already underway. However, the Requirement Sponsor judges that the requirement is sufficiently urgent to warrant inclusion in the current release anyway.

In this case, the Requirement Sponsor should **not** approach functional developers, IT or the Implementation Owner directly. Their first step should be to approach a member of the Prioritization Team. This person will consider the request and make a judgment as to whether they agree with the Requirement Sponsor about the urgency of the requirement.

If the Prioritization Team Member does agree with the Requirement Sponsor, they will approach the Release Manager to request that the requirement is included in the current release. The Release Manager will consider whether or not this can be done without impacting release dates.

If it can be done without impact on release dates, the Release Manager will arrange with the Implementation Owner for the new work to be carried out.

Otherwise, the Requirement Sponsor still has the option to escalate the matter to the Business Systems Owner, who will make their own judgment on the matter. If the Business Systems Owner decides the work should be included in the release after all, they will notify both the Release Manager and the Requirement Sponsor.

The Release Manager will then have to adjust their priorities. Some work may have to be left out of the release, or the manner in which it is carried out changed, to free up enough development resource to carry out the new work. Once the Release Manager has made this adjustment, they will notify both the Implementation Owner (who will in turn notify their team of the priority adjustment) and the Business Systems Owner.

Note that if it is necessary to alter the work carried out by IT as well as by developers, this can only be done in the beta release. The requirement to do this will be supplied to IT along with the alpha test results. Any functional changes in the new requirement that are dependent on IT will then be done as part of the beta release.

Two concurrent and interdependent projects

It is generally the case that more than one development process is underway within Business System Support at the same time – and there will inevitably be interdependencies between the various streams of work. This is managed via the following simple means: the person who is acting as Implementation Owner for each project may also be a Requirement Sponsor on other projects.

In other words, if project 1 has dependencies on project 2, the Implementation Owner for project 1 should use the Bug Tracking System to enter these dependencies as requirements on project 2. Then they will be prioritized and planned as per usual. Similarly, the Implementation Owner for project 2 may enter bugs for project 1, if project 2 also has dependencies on project 1.

Note in particular that the same exception and escalation mechanism described above can be used if dependencies on another project only manifest themselves once development work on that project has already started.

Writing of functional specifications

In order that each Implementation Owner can maintain proper control over the systems they are responsible for – keep each system **consistent**, and **maintainable** going forward – the development process assumes that:

- Business requirements will be submitted by any member of Business System Support, via the Bug Tracking System, using a template that provides sufficient information for the work to be acted upon.
- Functional change specifications will be created and revised only by members of the functional team concerned with that particular system, who are familiar with all parts of the system concerned and its intended future maintenance path.

Hence we see in the above process diagram that specifications for each change are drawn up by Functional Development rather than the Requirements Sponsor.

This is not to say that each functional specification will result in new or revised *program* specifications. In many cases, depending on the nature of the change required, it will be appropriate to provide details of the change in a small document separate from existing program specifications.

It is the responsibility of the Implementation Owner to make sure that the documentation for their entire system is kept up to date, in whatever form they judge to be most suitable for use by Business System Support and future maintenance. Some aspects of the system may be better documented via an online data dictionary than by text documents, for example.

CASE STUDY 1

Question

Write a program that reads numbers which are in the range 0 to 100, till it encounters -1. Print the sum of all the integers that you have read before you encountered -1

INPUT:

A sequence of integers separated by whitespace. There may be other integers following -1.

OUTPUT:

Sum of all integers in the sequence before you encounter -1. Any integer that is input after -1 in the sequence should be ignored.

CONSTRAINTS:

Atmost 10 integers will be given in the input. One of them is guaranteed to be a -1.

Inputs will be in the range 0 to 100 (both included).

Solution:

```
#include<stdio.h>

int main()
{
int sum=0;
int number=0;
do
{
sum=sum+number; //update partial sum
scanf("%d",&number); //read a number from the input
}while(number!=-1); //check whether recently added number is -1 or not
printf("%d",sum); //print the final sum
return 0;
}
```

Public test cases: Input	Output
2 -1 2 3	2
-1 4 5	0
10 3 4 -1	17
2 2 3 4 5 6 -1 7 8 9	22

Private test cases: Input	Output
-1	0
0 0 0 2 -1 4 99	2
2 3 4 -1	9

CASE STUDY 2

Question

Solution described in the video.

Given three points (x_1, y_1) , (x_2, y_2) and (x_3, y_3) , write a program to check if all the three points fall on one straight line.

INPUT:

Six integers $x_1, y_1, x_2, y_2, x_3, y_3$ separated by whitespace.

OUTPUT:

Print "Yes" if all the points fall on straight line, "No" otherwise.

CONSTRAINTS:

$-1000 \leq x_1, y_1, x_2, y_2, x_3, y_3 \leq 1000$

Solution:

```
#include<stdio.h>
```

```
int main() {
```

```
int x1,y1,x2,y2,x3,y3;
```

```
//Reading all 6 integers from the input using scanf()
```

```
scanf("%d %d %d %d %d %d", &x1,&y1,&x2,&y2,&x3,&y3);
```

```
//Checking if the slopes  $(y2-y1)/(x2-x1) == (y3-y2)/(x3-x2)$ . If they are equal, then all the points lie on the same line.
```

```
//Instead of performing division in LHS and RHS, we cross multiply  $(x2-x1)$  and  $(x3-x2)$  to handle the case when either  $(x2-x1) = 0$  or  $(x3-x2) = 0$ .
```

```
if ((y2-y1)*(x3-x2) == (y3-y2)*(x2-x1)) {
```

```
printf("Yes");
```

```
} else {
```

```
printf("No");
```

```
}
```

```
return 0;
```

```
}
```

PUBLIC TEST CASES:

Input	Output
1 0 0 3 0	Yes
-2 0 -2 1 -2 2	Yes
-62 14 -18 -23 -6 23	No
1 1 1 2 1 3	Yes

PRIVATE TEST CASES:

Input	Output
71 44 -36 -47 60 -74	No
0 1 0 4 0 -10	Yes
-26 24 77 -44 -55 -28	No
8 -4 10 0 23 26	Yes
60 -9 -71 -57 2 -71	No
7 9 72 74 -20 -28	Yes
9 -1 23 13 422 412	Yes
10 30 -18 -54 23 69	Yes

CASE STUDY 3

Question

The digital root (also called repeated digital sum) of a number is a single digit value obtained by an iterative process of summing digits. Digital sum of 65536 is 7, because $6+5+5+3+6=25$ and $2+5 = 7$. Write a program that takes an integer as input and prints its digital root.

INPUT: A single integer N

OUTPUT: Digital root of the number N.

CONSTRAINTS:

$1 \leq N \leq 10^7$

PUBLIC TEST CASES:

Input	Output

65536	7
1214	8
3	3
9199999	1

PRIVATE TEST CASES:

Input	Output
99999	9
1233	9
1234	1
132224	5
239123	2
96999999	6
9077	5

887	5
9009	9

Solution: Check the video posted in the course webpage for a detailed explanation of the following code:

```
#include<stdio.h>
```

```
int main()
```

```
{
```

```
int N, sum=0;
```

```
scanf("%d",&N);
```

```
while(N>9){
```

```
sum=0;
```

```
while(N>0){
```

```
sum += N%10;
```

```
N = N/10;
```

```
}  
  
N = sum;  
  
}  
printf("%d",N);  
  
return 0;  
}
```

CASE STUDY 4

Question: Write a program to print all the factors of a positive integer A.

INPUT: A single integer A

OUTPUT: Factors of the number A, in ascending order, separated by whitespace. 1 and A are also factors of A.

CONSTRAINTS: $2 \leq A \leq 10000$

Solution:

```
#include<stdio.h>  
  
int main()  
  
{int number;
```

```

int i=1;

scanf("%d",&number);

printf("%d",i);

for(i=2;i<=number;i++) //iterating over all numbers from 2 to number {

if(number%i==0) //checking whether 'i' is a factor of number or not {

printf(" %d",i); //printing a factor with a preceding whitespace

}

}

return 0;

}

```

PUBLIC TEST CASES:

Input	Output
6	1 2 3 6
8128	1 2 48 16 32 64 127 254 508 1016 2032 4064 8128
92	1 2 423 46 92
97	1 97

PRIVATE TEST CASES:

Input	Outpt
496	1 24 8 16 3162 124 248 496
28	1 24 7 14 28
24	1 23 4 6 812 24
3234	1 23 6 7 11 14 21 22 33 42 49 66 77 98 147154 231 294 462 539 10781617 3234
4006	1 22003 4006
2003	1 2003
30	1 23 5 6 10 15 30
2	1 2

CASE STUDY 5

Question: C Program to Store Information(name, roll and marks) of a Student Using Structure

This program stores the information (name, roll and marks) of a student and displays it on the screen using structures.

Solution:

```
#include <stdio.h>
struct student
{
    char name[50];
    int roll;
    float marks;
} s;

int main()
{
    printf("Enter information:\n");

    printf("Enter name: ");
    scanf("%s", s.name);

    printf("Enter roll number: ");
    scanf("%d", &s.roll);

    printf("Enter marks: ");
    scanf("%f", &s.marks);

    printf("Displaying Information:\n");

    printf("Name: ");
    puts(s.name);

    printf("Roll number: %d\n",s.roll);
```

```
printf("Marks: %.1f\n", s.marks);  
  
return 0;  
}
```

Output

Enter information:

Enter name: Jack

Enter roll number: 23

Enter marks: 34.5

Displaying Information:

Name: Jack

Roll number: 23

Marks: 34.5

Case study to create a Mileage Expense Sheet in Excel

If you travel frequently for your job -- even just around town -- the expenses you incur can add up quickly. Many businesses reimburse employees for these expenditures and even if they don't, you may be able to deduct them from your taxes. An easy way to track your mileage and other travel-related costs is to use an Excel spreadsheet. No need to start from scratch, as Excel 2013 provides feature-rich templates you can start using right away.

Step 1

Start Excel and select the "File" tab. Click "New," type "mileage" into the search box and press "Enter." Click a template to preview it and click "Create" to open a new workbook with the template you want to use. For instance, the stylish "Travel Expense Report" includes a mileage log as well as columns for other expenses; the "Gas Mileage Log with Chart" template adds a line graph that displays your MPG; and the "Travel Expense Report with Mileage Log" is a streamlined table with built-in functions to calculate expenses.

Step 2

Enter trip details. Most mileage expense templates provide multiple columns in which you can list helpful information, such as the date, locations you traveled to and from, the purpose of the trip and other details.

Step 3

Enter odometer readings from the beginning and end of your trip. Most templates provide a column for each of these numbers, calculating your mileage for each trip based on the difference between the two column values. In addition, the templates calculate the total miles for the worksheet at the bottom of the mileage column.

Step 4

Add fields. For instance, if you want to track other travel costs, such as meals, automotive expenses and lodging, you can insert new columns. Right-click the column next to which you want to insert a new column and select "Insert." Excel inserts a new column to the left. Add a descriptive heading in the first cell of the column.

Step 5

Change the appearance of the worksheet. Select the "Page Layout" tab and choose a different color or font theme to change the colors and fonts in the worksheet. Click any cell in the table to activate the Design tab under Table Tools and select a different table style or change table style options, such as adding or removing banded rows or columns.

Step 6

Calculate mileage reimbursements if the template does not do so. Enter the mileage rate in an unused cell on the worksheet. Select the cell in which you want to display your reimbursement amount and click inside the Formula Bar. Enter the formula " $=(\text{cell containing mileage})_{\text{(cell containing rate)}}$ " to calculate the total. For instance, if your total miles is in E4 and your rate is in K4, entering " $=E4_{\text{K4}}$ " provides the product of total miles times rate.

Step 7

Calculate other expenses, if desired. If you added a column for other expenses, select the final cell in that column and click "AutoSum" in the Editing group of the Home tab. Excel automatically calculates the numbers in the column. In addition, you can find the total of your mileage reimbursement and other expenses. Select the cell in which you want to display the total and enter " $=\text{SUM}(\text{first cell},\text{second cell})$ " to calculate your total.

Case study on the Importance of Excel in Business

Microsoft Excel was released in 1985 and has grown to become arguably the most important computer program in workplaces around the world. Whether you are budgeting, organizing client sales lists, or need to plan an office social gathering, Excel is a powerful tool that has become entrenched in business processes worldwide.

Finance and Accounting

If you walk through the finance or accounting department at any major corporate office, you will see computer screens filled with Excel spreadsheets outlining financial results, budgets, forecasts, and plans used to make big business decisions.

This is the area of business with the biggest reliance and benefit from Excel spreadsheets. Advanced formulas in Excel can turn manual processes that took weeks to complete in the 1980s into something that takes only a few minutes today. If you would like to learn more formulas, Investopedia Academy has an excel for finance course.

Most users know that Excel can add, subtract, multiply, and divide, but it can do much more with advanced IF functions when coupled with VLOOKUP, INDEX-MATCH-MATCH, and pivot tables. (For more, see the Investopedia *Guide To Excel For Finance: PV And FV Functions*.)

Marketing and Product Management

While marketing and product professionals look to their finance teams to do the heavy lifting for financial analysis, using spreadsheets to list customer and sales targets can help you manage your sales force and plan future marketing plans based on past results.

Using a pivot table, users can quickly and easily summarize customer and sales data by category with a quick drag-and-drop. All parts of business can benefit from strong Excel knowledge, and marketing functions are not exempt.

You Can Do Anything With a Spreadsheet

Using Excel for business has almost no limits for applications. Here are some examples:

- When planning a team outing to a baseball game, you can use Excel to track the RSVP list and costs.
- Excel creates revenue growth models for new products based on new customer forecasts.
- When planning an editorial calendar for a website, you can list out dates and topics in a spreadsheet.
- When creating a budget for a small product, you can list expense categories in a spreadsheet, update it monthly and create a chart to show how close the product is to budget across each category.
- You can calculate customer discounts based on monthly purchase volume by product.
- Users can summarize customer revenue by product to find areas where to build a stronger customer relationships.

This is a very short list to give you an idea of the diverse uses for Excel. On a typical day at the office, I have Excel open 4-8 hours. I could not do my job effectively without it.

The Bottom Line

Excel is not going anywhere, and businesses will continue to use Excel as a primary tool for diverse functions and applications ranging from IT projects to company picnics.

A working knowledge of Excel is vital for most office based professionals today, and stronger Excel skills can open the door to promotion and leadership opportunities. Excel is a powerful tool but cannot function alone. It takes a savvy computer user to take advantage of everything Excel has to offer to provide the best results for their company.

Case study on the Importance of MS-WORD in Business

Word may be the word processing powerhouse in Microsoft's Office suite, but the program can do more than just put words on paper. It also incorporates desktop publishing, design and data handling features, allowing businesses to create many different types of professional documents for both internal and external purposes.

Using Word for Letters and Mailings

Businesses typically use Word to manage their outgoing correspondence needs. For example, you can use the program to create a single letter at a time or to create a mailshot that sends a letter to some or all of your customers. Mail merge functions can automatically populate a letter template with relevant contact and address information, using databases you create yourself in Word or data you import from other Office programs such as Excel or Outlook. Word can also print address labels and envelopes.

Using Word to Create Documents and Forms

You can use Word to create just about any kind of business document, including company reports, presentations, budgets, proposals and plans. It can help you build a library of key forms, such as invoices, statements, receipts, memos and agendas. Word's design features are easy to use, enabling you to use data visualization tools to add tables, charts and graphs to your documents. Its SmartArt function uses graphics to communicate information.

Using Word to Produce Promotional Materials

You can use Word to create promotional and marketing materials that you send out to customers and prospects. Common options include brochures, flyers and newsletters. Award certificates and cards may be useful if you run internal promotions to incentivize your employees. Word can also handle stationery design, allowing you to format and produce your own letterheads and even business cards. This may be particularly useful for small businesses that may struggle to pay third-party design and print costs.

Using Word to Build Branding

If you want your employees to use a standardized letter or memo format, you can design one and save it as a template that the entire company can use. You can use styles and themes to define exactly how all of your business documents will look, giving you a consistency of color, fonts and effects. If you prefer, you can download free Microsoft templates. Microsoft groups some templates into style sets, so you could apply the same theme to a range of marketing materials, documents and forms, giving you a consistency of branding.

CASE STUDY 1

Using 3D Computer Graphics for Furniture Design and Marketing

Problem: Computers are today a very important communication tool between the designer and the client and have been established as something necessary in many designers' enterprises. (Curry et al, 1993). CAD software allows designers to easily manipulate the design to meet the needs of clients as a marketing tool (McLain-Kark and Rawls, 1988). Since early 1970, when the first CAD software was designed and until 1980, the 2D and 3D CG (3 Dimensional Computer Graphics) were a small and specialized section, due to the cost of the computers and the lack in programs friendly to the user (Foley κ.ά. 1990). The 3D CG, in order to reach today's level of development went through a decade which was focused on intensive research regarding them (Bertol, 1994; McConnel and Waxman, 1999).

The use of 3D graphics in the sector of the furniture design had initially the target to impress. (Maxmann and Zhang, 1995; Otjacques et al, 2008). But soon, it was found that the potentials of their use are much bigger. Nowadays, those graphics do exist in the area of furniture and expand in areas beyond its design. (King, 1998; McConnell and Waxmann 1999; Leslie and Reiner 2006; Oh et al 2006; Ansel et al 2007). This means that, the Greek furniture market, shows a mobility regarding the use of software packets for design. It is not known though, to what degree this mobility, with the introduction and the use of those new technologies and the new potentials they can offer, consists a new phase of the furniture sector's development (Gianousiadis, 1981; Sinometis, 1982; Clemons and McLain -Kark 1991). The furniture design and the capability of creation and introduction in the market of new models, have to do with the cycle of life of those in the market (Nanouris, 1981; Bumgardner et al 2001, Nes and Cramer 2003; Papadopoulos, 2005). In this framework, the institution of "awards for furniture design" were repeatedly created and operated both in the international and the Greek area (Stamou 1982, Benningston, 1986; Pile, 1990).

Recently the interest of the professional designers was focused in the use of 3D CAD software in 3D printers of rapid prototyping and manufacturing to produce buildings, furniture and models (Sass, 2005; Iwamoto, 2004; Igarashi et al, 1999; Lipson and Spitalni, 2002).

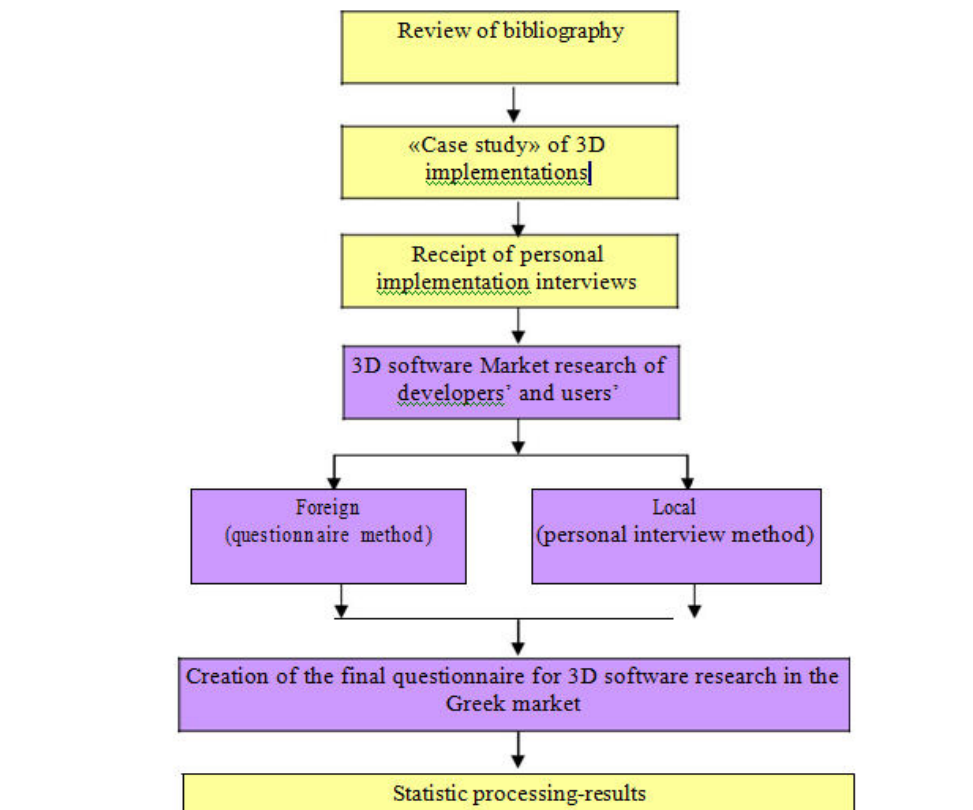
Despite the mobility of those programs in the furniture sector, it hasn't been clarified enough, how the furniture enterprises value those programs. The result of this vague picture is, in general, the slow acceptance and promotion of the use of this relatively new technological mean. So, what remains is to find out and analyze the existing implementations of 3D graphics programs in the sector of furniture design, that it the essential usefulness of them and their benefits are being evaluated and that conclusions regarding the aim and the potentials of their expansion and their implementation's expansion are made. So, in this sector of furniture design, the research is judged necessary.

The aim of this research is to look for and find out the degree to which the 3D CG has penetrated and is utilized in the furniture design and under which way of thinking. In this framework, the documentation and the evaluation of the benefits and advantages of the use of software packages for design, also consists another aim of the research. Aim of this research is also to find out to what degree the 3D CG has penetrated in other procedures of the furniture sector, apart from the design area. The combination of the development and the use of those programs with special users – enterprises characteristics – is being sought, so that we can interpret with this the degree to which those programs are being developed and used. The ultimate target is,

through this research's conclusions, to benefit: a. the furniture enterprises decision making process regarding the use of those programs and b. the proper training of the executives.

Methodology: The organization of the research and the methodological procedure that was implemented is briefly given in the Fig 1.

The market research covered the 3D CAD software, creation enterprises inside and outside the country of Greece, with initial implementation of a relative research on the internet, so that the 3D software creation enterprises are located and that a full catalog of 3D software is created. A first communication with those enterprises was made (using the phone or the e-mail). Then the creation of a preliminary questionnaire was made, which was answered from the abroad enterprises through e-mail and from the local ones through a personal interview with their representatives. The aim of this questionnaire was to gather information regarding the existing 3D CAD software, to see their potential use in the furniture sector, as well as to find out the degree of the information on this subject. The analysis of the answers to the questionnaire made the enrichment, the expansion-completion of the information possible and leads to the creation of a completely new and fully focused on those subjects questionnaire. The creation of this questionnaire was made with the implementation of all the rules of the social science's methodology (McCarthy and Perreault 1987; Kouremenos, 1987; Zacharopoulou, 1993; Kiriazopoulos and Kioulafas 1994; Churchill, 1996; Kotler 2001) and of the market research (Lee et al, 1987; Tsaklaganos, 2000). The total of the questions (11 open type and 11 close type), was structured in 2 subgroups, the one of the questions regarding the 3D CAD software (type, use, implementations, cost, benefit, special features etc) and the one of the special characteristics of the enterprises that use them in the furniture design or CAD-CAM systems.



From the total of the enterprises that use 3D software for the design and the production of furniture, a sample of 15 enterprises was randomly chosen, which was then expanded to 35 (Zacharopoulou, 1993; Tsaklaganos, 2000). The questionnaire was sent to this sample. The research was made in the period 2003-04.

The answers were then statistically analyzed with the social-economical statistic packet SPSS for Windows ver 16.0 where 121 variables were used and the Frequencies, Descriptives and Crosstabs checks were made (Norusis, 1997; Howitt and Cramer, 2003).

From the questionnaires that were sent, a percentage of 87% was sent back to us, which is a really high percentage compared to similar researches.

Initially, the percentage of enterprises information regarding the market of 3D CG was researched. As it was expected, the total of the CAD – CAGD software users is aware of the terms «photorealistic» and «3D», while especially high is the percentage that is aware of the terms «three dimensional representation», «photo representation» and «Render» (Fig. 2). Other terms that have to do with 3D CG special terms, are known from only 33.3%. It is worth to mention here, that this percentage consists of people only within the age of 21 to 30 years old. This result can also be regarded as expected, as people of younger ages are more familiar to new technologies, in opposition to the people of older ages that tend to dislike them to some degree.

Despite the fact that the take overs, the amalgamations and the changes in the condition of the enterprises is an everyday reality that causes confusion to some degree, it was found that in the Greek market we have 39 3D programs, which is a really significant number for the size of the Greek software market, from which the most popular are given in declining order as follows: AutoCAD (100%) > 3ds MAX (83.3%) > Archicad (75.0%) > Maya - Solidworks - Pro-engineer - Lightwave (58.3%) > ESTIA (50.0%) > 1992 PRO - Rhinoceros - Form Z - Catia (41.7%) > Vector works - Cinema 4D (33.3%) > Softimage XSI - Messiah - Truespace - Imagine - Renderman (25.0%) > Strata 3D - Hoydini - Amapi/Infini

D / Carrara - Ray dream studio (16.7%) > Inventor series - Ideas master – Solidedge – Poser (15.4%) > Extreme 3D – Universe (8.3%) > Bruce – Helix - Motion builder – Sculptor – Aris – Tekton - Claris CAD – Planit (7.7%) > Allplan (0.0%).

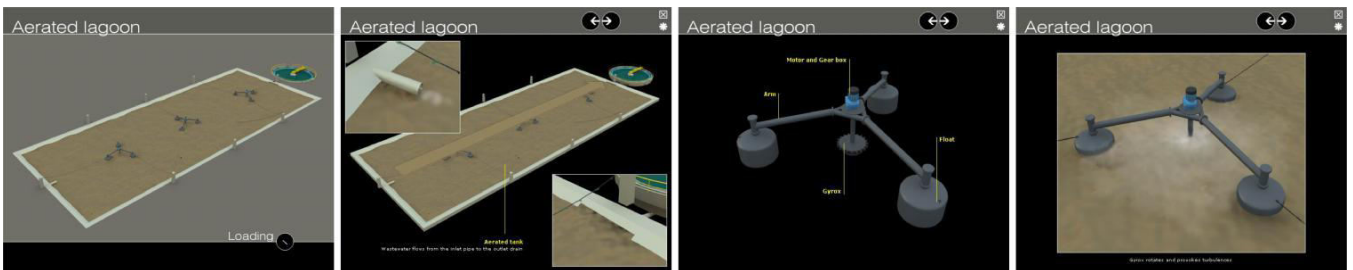
CASE STUDY 2

Computer Graphics in Environmental Education

Problem: In the last decade sustainable development has become a key concept in most aspects of life, of which education is an integral part. Therefore, environmental education has turned into an important part of many academic curricula [Crofton 2000]. Naturally the field of engineering and science ought to play a pioneer role in offering renewed courses in this field, as engineers are responsible for safe-guarding the environment health through it, by the means of design, construction, production and inspection.

In practically every aspect of engineering and science, computer-based tools are being developed to aid students and professionals in learning through modeling, visualization, simulation and inter-action. The Internet has been utilized as the ideal medium to create platforms for students to use for its wide availability but also computer graphics based software are developed in order to enhance the teaching process. The students in engineering degrees usually have difficulties when it comes to understand some concepts, even the basic ones. And the key is when they express their frustration — *“I don’t see it”*.

Here is where computer graphics comes into play, expressing in a visual way these concepts and trying to help the engineering students train the necessary skills to carry out creative design based on abstract thinking process [Ursyn and Sung 2007]. But the users of these educational tools usually should be helped in order to understand the methods of presentation of specific multimedia technology, where text, sound, pictures, video, 3D and interaction can be combined into a whole



- **Evaluation of treatment technologies.** This second activity involved review of potential technological interventions leading to improved water efficiency through conservation, reclamation and reuse. The processes covered broadly fall into both High-tech (appropriate for developed countries or large scale industries) and Low-tech (appropriate for developing countries or rural communities) categories.
- **Process modelling.** This activity covered the simulation of impacts of specific technology interventions on water use; modelling the effect of a particular technology and its operating conditions on parameters such as throughput, quality characteristics and energy use; optimisation of flowsheet, location and flow of recycle streams and operation economics; simulation of options for water reuse to create closed loops in the selected processes; determination of process sensitivities and predicting the effect of intervention on a whole system and development of operating strategies.
- **Visualization.** A key aspect in this educational project was the visualization of all the processes, to ensure a correct understanding. This includes visualising the raw data from previous activities, creating virtual scenarios and allowing the user to see the impact of specific technology interventions.

Another important educational feature was to allow the user to select a combination of operating parameters for any given process and then observe the simulated outcome.

- **Integration of course contents.** Due to the crucial importance of the visualization task in the design of the ED-WAVE project, adapted computer graphics theory was included in developed curricula, as well as all the technical and theoretical wastewater treatment content. The following specific courses were created:

- Technologies for efficient water use.
- Modelling and visualisation of water treatment processes.
- Efficient water and energy use in pulp and paper industry.
- Computer graphics and new technologies in environment education.

- **Training.** Training workshops were held in multiple locations. The training was aimed at professionals from educational and research institutions, environmental practitioners, technical service providers, potential end users from various industries and municipal bodies, local governments, environmental agencies and policy makers responsible for technical education and e-Learning.

The ED-WAVE tool The education tool is a package of computer applications supplemented by data files, animations and demonstrations. The system consists of 4 modules: Reference Library (RL), Case study Manager (CM), Process Builder (PB) and Treatment Adviser (TA). The package can be divided to a theoretical part (RL, CM) and a practical part (PB, TA and models included in the RL). The RL is a structured e-book with theoretical knowledge on wastewater unit operation as well as training examples; CM contains case studies

from real life applications. PB serves to construct a full treatment sequence from basic unit operations presented as blocks and TA assists in problem solving exercises. In addition supplemental "glossary" section gives the user brief information about terminology encountered in the software. Thus the tools components support the complete training activity from presentation to problem solving and design of the units. All materials are presented in structured thematic ways and navigation is similar to the World Wide Web browsing. Novel techniques such as case base reasoning and stream set analysis are implemented in the components of the tool. The four tool modules consist in more detail as follows:

Reference Library (RL)

This module aims to assist the tutor in the formulation of his presentation of select technologies and of the formulation of coursework. It also aims to provide the user with an easy to use concise form of the traditional book- with text, pictures and problems- and to virtually walk the user through each technology. The RL is not a substitute for textbooks though. It provides concise information and technical details but urges the user to the use of further published work through references. The module provides the user with a comprehensive overview of 21 processes used for wastewater treatment.

Case Study Manager (CM)

This module contains a collection of past wastewater treatment situations based on design experience from real life situations which can be used to solve a new problem specified by the user. The case base of

the CM includes a total of 70 case studies obtained from municipal and industrial wastewater treatment plants from both Asia and Europe.

The module serves the dual aim of first acquainting the user with real wastewater treatment practices in the selected sectors, familiarising oneself with parameters of concern and their range in the relevant industry and with the degree of achievement of treatment. The module allows the user to train based on real industry data and test one's own problem and scenario. For maximum involvement and training outcome, the user is allowed to set the weight of the input parameters himself under the instruction of the tutor for a selected scenario.

3.3 Treatment Adviser (TA)

Each process consists of several sections such as theoretical background, design parameters or examples, but is in the "view section", where the user can find a schematic representation of each technology, view 3D image(s) of each process and also view a full animation with explanatory text showing and describing each process. In all the cases 3D images were modelled and rendered from digital pictures and engineering drawings, from operating wastewater treatment plants. In animations, the user is taken in a virtual step by step walk through in each process. Pointers, labels and accompanying text, explain the main features of each technology during the animation show. The animation is split to frames and sub frames. The transition from one frame to the following is controlled by a "forward" button, so the user can regulate the pace of the demonstration. In all animations cross section views of unit operations allow the user to have an inside view, not presented

Case Study Manager (CM)

This module contains a collection of past wastewater treatment situations based on design experience from real life situations which can be used to solve a new problem specified by the user. The case base of the CM includes a total of 70 case studies obtained from municipal and industrial wastewater treatment plants from both Asia and Europe.

The module serves the dual aim of first acquainting the user with real wastewater treatment practices in the selected sectors, familiarising oneself with parameters of concern and their range in the relevant industry and with the degree of achievement of treatment. The module allows the user to train based on real industry data and test one's own problem and scenario. For maximum involvement and training outcome, the user is allowed to set the weight of the input parameters himself under the instruction of the tutor for a selected scenario.

Treatment Adviser (TA)

Visible in a real wastewater treatment plant visit and observe the phenomena taking place within. The importance of visual media in teaching and training cannot be overstressed. Students and young professionals who have a theoretical knowledge of technologies and processes have seldom had the opportunity to actually see such units in practice. Pilot plant units in laboratories and field visits offer contact with only a limited number of technologies, usually restricted to those applied locally. Moreover, since this is a Europe-Asia cooperation programme, even tutors and experienced professionals haven't had the chance to familiarise themselves with some of the technologies

This module is activated when the user is not satisfied with the solution suggested by CM. Based on an analysis of parameters submitted by the user, the TA generates one or several possible treatment sequences which are then evaluated using data from the past applications of the technology.

The generated sequences are ranked according to evaluation values gained using data from the past applications of the technology. The user can browse on these sequences and save the selected treatment to be open then in the Process Builder as a constructed scheme.

Process Builder (PB)

This module can be used in place of the CM to create and view a valid treatment sequence. The module contains 24 icons (each icon representing one process) that can be dragged, dropped and connected to generate a valid treatment sequence. The module is based on a valid sequence matrix allowing the user to view when a treatment scheme is not feasible. The target of the module is that the user, after having familiarised oneself with the concept of the methods and with the practices used in the industry, or with the sequence proposed by the CM, creates one's own wastewater treatment plant, in the form of unit operations blocks. The system accepts treatment sequences by assessing whether two subsequent technologies can be applied or not. The matrix for the permission

CASE STUDY 3

The use of 3D computer graphics in the diagnosis and treatment of spinal vascular malformations

Problem: Digital subtraction (DS) angiography is the gold standard for diagnosing spinal vascular malformations. Recently, multi detector row spiral CT and contrast-enhanced MR angiography have been introduced as screening examinations before DS angiography. These methods, however, do not always determine the accurate location of an arteriovenous shunt because the resulting images lack information about the spinal cord or the dura mater.

METHODS:

Between April 2009 and December 2010, 13 patients underwent imaging evaluations for spinal vascular malformations at the authors' university hospital. This group included 8 patients with spinal dural arteriovenous fistulas (AVFs), 3 with perimedullary AVFs, and 2 with intramedullary arteriovenous malformations. Using data from these patients, the authors attempted to develop 3D computer graphics (CG) based upon the fusion of 3D rotational angiography and postmyelographic CT. They subsequently verified the accuracy of this imaging method. Ten of these 13 patients underwent surgical treatment for their lesions (11 AVFs), and for these 11 lesions the authors compared the diagnoses obtained using 3D CG with those obtained using conventional DS angiography.

RESULTS:

In all 13 cases, 3D CG images of the spinal lesions were successfully developed using the patients' actual data. Four (36%) of 11 AVFs were correctly identified using DS angiography, whereas 10 (91%) were correctly identified using 3D CG. Results from 3D CG of spinal AVFs corresponded well with operative findings, and 3D CG was significantly better than conventional DS angiography at predicting AVF location ($p = 0.024$, Fisher exact test).

CONCLUSIONS:

To the authors' knowledge, this is the first reported case series in which 3D CG of spinal vascular malformations was used to provide simultaneous, stereoscopic visualization of the spinal vascular system, spinal cord, dura mater, and bone. The 3D CG method provides precise visual images for the diagnosis and treatment of these lesions.

CASE STUDY 4

Computer Graphics in Automotive Design

Problem: In this case study, we explore how we take a three-dimensional image and render it effectively in two dimensions. This type of operation is very important in automotive design, for it allows engineers to experiment with images on a computer screen instead of using a three-dimensional model of the automobile. We will first discuss how to convert a three-dimensional image to a two-dimensional picture using a perspective projection. You should read Section 2.8 before attempting this case study.

The data for this case study was derived from measurements made on the author's 1983 Toyota Corolla; all coordinates are measured in feet. The origin is placed at the center of the car.

Data Points: $(-6.5; -2; -2.5)$, $(-6.5; -2; 2.5)$, $(-6.5; .5; 2.5)$, $(-6.5; .5; -2.5)$,
 $(-2.5; .5; -2.5)$, $(-2.5; .5; 2.5)$, $(-.75; 2; -2.5)$, $(-.75; 2; 2.5)$,
 $(3.25; 2; -2.5)$, $(3.25; 2; 2.5)$, $(4.5; .5; -2.5)$, $(4.5; .5; 2.5)$,
 $(6.5; .5; -2.5)$, $(6.5; .5; 2.5)$, $(6.5; -2; 2.5)$, $(6.5; -2; -2.5)$

We collect the data points in a data matrix D : each column contains the x , y , and z coordinates of a particular data point. Since we will be using homogeneous coordinates, we also include a fourth row containing all ones.

2	-6.5	-6.5	-6.5	-6.5	-2.5	-2.5	-.75	-.75	3.25	3.25	4.5	4.5	6.5	6.5	6.5	6.5	3
6	-2	-2	.5	.5	.5	.5	2	2	2	2	.5	.5	.5	.5	-2	-2	
	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	<small>2.5</small>	
4	-1	1	1	-1	-1	1	-1	1	-1	1	-1	1	-1	1	1	-1	5

This data matrix D accompanies this case study. In addition to knowing the data points, we must also know how they are to be connected. In our case we can simply supply a list of which points connect to which others. We could also use an adjacency matrix. This matrix consists only of 0's and 1's; the $(i; j)$ entry in the matrix is a 1 if points i and j are connected. Figure 1

CASE STUDY 5

A Practical Guide to Polygon Mesh Repairing

Problem: Digital 3D models are key components in many industrial and scientific sectors. In numerous domains polygon meshes have become a de facto standard for model representation. In practice meshes often have a number of defects and flaws that make them incompatible with quality requirements of specific applications. Hence, repairing such defects in order to achieve compatibility is a highly important task – in academic as well as industrial applications. In this tutorial we first systematically analyze typical application contexts together with their requirements and issues, as well as the various types of defects that typically play a role. Subsequently, we consider existing techniques to process, repair, and improve the structure, geometry, and topology of imperfect meshes, aiming at making them appropriate to case-by-case requirements. We present seminal works and key algorithms, discuss extensions and improvements, and analyze the respective advantages and disadvantages depending on the application context. Furthermore, we outline directions where further research is particularly important or promising.

Introduction:

Nowadays, digital 3D models are key components in many industrial and scientific sectors, such as product design and manufacturing, gaming, simulation, cultural heritage, archaeology, medicine and bioinformatics. Due to their flexibility, expressiveness and hardware support, polygon meshes have become a de facto standard for model representation in many of these domains. Each application, however, has its own quality requirements that restrict the class of acceptable and supported models. In practice real meshes often have a number of defects and flaws that make them incompatible with such requirements. Hence, repairing these defects in order to achieve compatibility is a highly important task – a task whose complexity and level of difficulty is not uncommonly underestimated by non-experts in the field.

This importance is in place for both, academic and industrial applications: researchers in all areas of Computer Graphics want (and not rarely have) to assume a certain level of quality and integrity of the meshes they work with (to avoid unnecessarily complex algorithms or to make concepts work out), whereas practitioners have to reliably deal with real-world meshes in demanding industrial workflows which similarly rely on certain assumptions.

Thus, this tutorial has a twofold objective: first, we show how to exploit state-of-the-art techniques to solve the mesh repair problem in various scenarios; second, we describe the existing repairing methodologies and outline the directions where further research is particularly important. We systematically analyze the application contexts that deal with polygon meshes together with the requirements they pose and the problems they provoke, as well as the various types of defects that typically play a role and may make a mesh unsuitable. Subsequently, we consider existing techniques to process, repair, and improve the structure, geometry, and topology of an imperfect mesh to make it appropriate to case-by-case requirements. We describe seminal works and key algorithms, discuss extensions and improvements, and analyze the respective advantages/disadvantages while taking various key application contexts into account. Where available, we refer to existing implementations.

The tutorial is based on a recent extensive survey by the presenters [ACK], which is about to appear in ACM Computing Surveys. An accompanying website featuring freely obtainable implementations of several of the pre-sented methods is available at www.meshrepair.org. There we also provide further material and updates.

Outline

The Application Perspective

The tutorial provides a useful and handy overview of mesh repair techniques from a practical application perspective, by considering the 3D model lifecycle from production to ex-ploitation. Thus, we first discuss upstream applications (that create a mesh) based on the typical characteristics/defects of the meshes they produce, and then provide a classification of downstream applications (that use the model) based on the requirements they typically impose on their input meshes. By looking at the combinatorics of upstream application, repair method, and downstream application based on these criteria, we derive practical guidelines to decide which re-pair approaches are well suited for the data-link between any particular upstream-downstream pair – bridging the corre-sponding compatibility gap.

Overview and Problem Definition

We can define a mesh repairing algorithm to be a process that takes as input a surface mesh M and produces a modi-fied version $M!$ where some specific defects or flaws are re-moved or alleviated. This loose definition intentionally does not exclude methods that, while fixing specific defects, may newly introduce other flaws that again need to be fixed by subsequently applied methods – as it is often the case with available algorithms.

In general, it can be useful to investigate the context as follows:

What is the upstream application?

Determines characteristics of M

What is the downstream application?

Determines requirements on $M!$

Based on this information:

Is it necessary to repair M ?

If repairing is necessary:

Is there an algorithm that does it directly?

If direct repair is not possible:

Can several algorithms be used in sequence?

If not:

There is room for further research.

When defining the goal of mesh repair, the problem's inherent ill-posedness must be taken into account. Imperfect meshes with defects quite often represent an object ambiguously or incompletely and, without additional information (e.g. context, semantics), it can be impossible to decide how a certain defect is to be repaired in the right way. Depending on the types of defects, it can even be impossible to decide whether a mesh actually contains defects or flaws which need to be repaired. Hence, we also take a closer look at algorithms that accept additional information as input or allow for user-interaction in order to deal with this general problem.

Defect Categories

Most file formats that are used to represent polygon meshes are not guaranteed to represent only defect-free models, as they may easily encode non-manifold and/or non-orientable sets of polygons, isolated elements, intersections and a number of other defects that often are the source of problems in several contexts. We provide a categorization of all the issues that may need treatment – specifically, we distinguish among issues about local connectivity, global topology, and geometry. The following is a list of individual types of defects and flaws treated in the tutorial: isolated/dangling elements, singular edges/vertices, holes, gaps/overlaps, intersections, degeneracies, noise, aliasing, topological noise, inconsistent orientation.

Upstream Applications

Common mesh sources (i.e. upstream applications) can be characterized based on the *nature* of the data modeled (i.e. (physical) real-world data vs. (virtual) concepts) and on the *approach* employed to convert such data into polygon meshes (e.g. patch tessellation, raster data contouring, point cloud reconstruction). Both, nature and conversion approach, can be the source of defects in a mesh. In essence, to identify all the potential defects of a mesh based on the upstream application that produced it, it is often sufficient to identify the nature as well as the approach employed. In the tutorial we determine the specific properties of both aspects.

Downstream Applications

We provide an overview of the prototypical requirements of key application contexts. For instance, for the purpose of mere *visualization*, only the existence of significant holes is generally deemed unacceptable – all other types of defects can often be neglected. Other applications, e.g. *modeling*, demand at least topological manifoldness, for instance in order to be able to apply discrete differential operators. Even stricter requirements are to be fulfilled for, e.g., *rapid prototyping* purposes: the mesh model naturally needs to be convertible to a solid model, i.e. it has to well-define an interior and exterior volume. For this purpose the mesh definitely has to be closed and free of intersections and singular non-manifold configurations that would prevent an unambiguous volume classification.

Repair Algorithms

On the highest level we distinguish between methods that use a local approach (modifying the mesh only in the vicinity of the individual defects and flaws) and methods that employ a global strategy (typically based on remeshing of the input, which allows to more easily achieve robustness and global correctness guarantees).

Outlook

One insight that can be gained is that some repair tasks are *significantly* more challenging than others. While some problems can be easily formalized and unambiguously solved, non-trivial interpretations are necessary to provide robust and intelligent algorithms for, e.g., hole filling, gap closing, and intersection removal. We discuss the gaps in the available range of repairing methods and show up possible avenues for future research that could provide further valuable contributions in the field. Promising research directions include hybrid methods which are minimally invasive and still provide global guarantees, the high-level incorporation of meta-knowledge, and the vertical integration of multiple repair techniques to practical workflows.

Case Study on ALOHA (A Tank Source (Pool Fire))

Problem Statement: In a small industrial park outside Baton Rouge, Louisiana, a 500-gallon, 4-foot-diameter, vertical tank contains liquid benzene. On June 20, 2016, at 10:30 p.m. local time, a security guard discovers that liquid is leaking out of the tank through a 6-inch circular hole located 10 inches above the bottom of the tank. He also sees that the liquid is flowing onto a paved area in the industrial park. The guard thinks that the tank has just been filled that evening.

The temperature on scene is 80°F, with the wind from the southwest at 7 miles per hour (as measured at a height of 10 meters by a fixed meteorological tower at the site). The sky is more than half covered by clouds and the humidity is about 75 percent. A thunderstorm is approaching from the southwest. There is no low-level inversion. There are very few buildings in the industrial park and a large grassy field is located to the northeast of the industrial park.

The Local Emergency Planning Committee has requested that on-scene responders use ERPG-2 concentrations to define the toxic endpoints in their analysis of benzene hazards.

In this example scenario Thermal radiation threat if a lightning strike ignites the puddle and forms a pool fire.

Modeling a Pool Fire

Now that ALOHA has displayed the downwind distance to the ERPG-2 level, you want to assess the thermal radiation threat if the puddle is ignited by a lightning strike (or other ignition source) and forms a pool fire. For this example, you want to assess the threat assuming that the pool fire occurs soon after the puddle forms. Therefore, you don't need to enter new information for time, atmospheric conditions, or puddle size.

1. When you run multiple scenarios for the same incident, the threat zone estimates and Text Summary screen from the first scenario will change when you enter new information. Before you start running an additional scenario, either print out the threat zone picture and the Text Summary screen or paste them into a word processing document. You'll need the original information to compare the scenarios later.
2. Close the threat zone window.
3. When you set the source for the first scenario, you told ALOHA that the benzene was leaking from a tank, but it was not burning. You need to return to the Type of Tank Failure screen and tell ALOHA that now the chemical is burning and it has formed a pool fire. Begin by selecting the Tank source again. In the SetUp menu, point to Source, then select Tank. A Tank Size and Orientation dialog box appears.
4. Notice that all of your original information is already entered into the dialog box. The dimensions of the tank have not changed, so you can just click OK to move to the next screen.
5. Your original information is still correct on the Chemical State and Temperature and the Liquid Mass or Volume dialog boxes. Click OK on each screen until the Type of Tank Failure dialog box appears.
6. Choose the Leaking tank, chemical is burning and forms a pool fire option. Click OK. An Area and Type of Leak dialog box appears.

7. Your original information is still correct on the Area and Type of Leak, Height of the Tank Opening, and Maximum Puddle Size dialog boxes. Click OK on each screen.

The source strength information that you have entered, and the results of ALOHA's source strength calculations, appear in the Text Summary. ALOHA estimates that the puddle burns for about two minutes, and that the Maximum Burn Rate is 1,610 pounds per minute. Notice that ALOHA estimates that the puddle reached a maximum diameter of 15.0 yards, which is smaller than the 21.6 yards estimated for the evaporating puddle, because the chemical is being consumed in the fire before the puddle can spread to the larger diameter

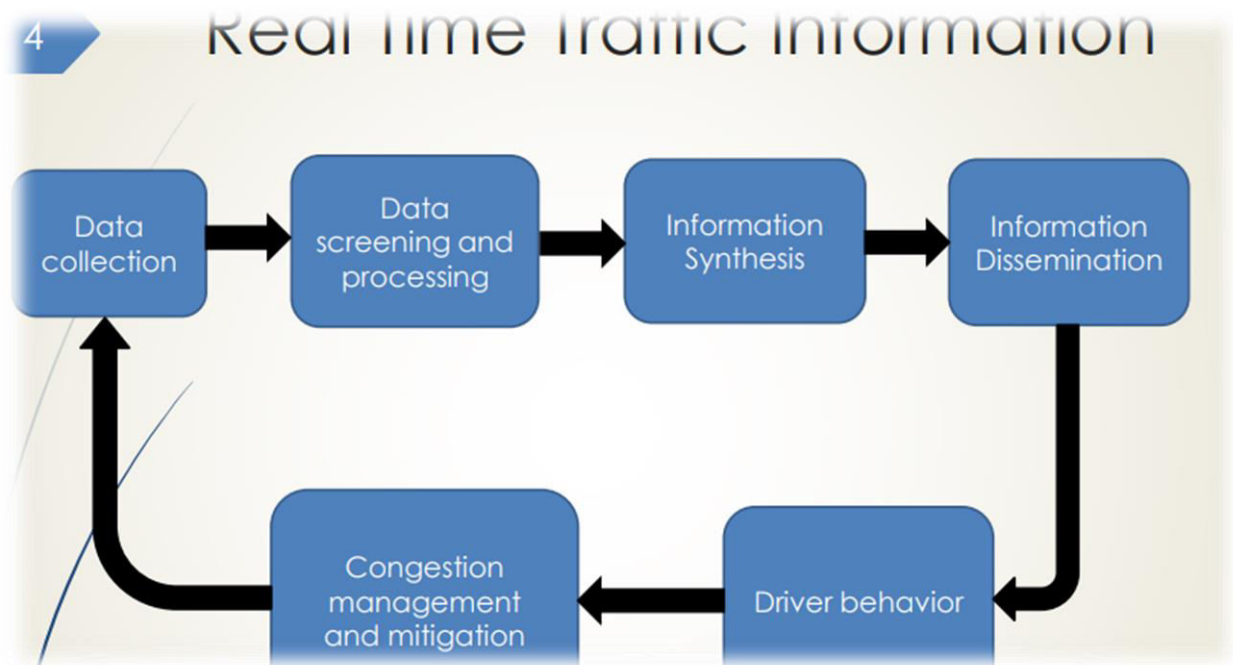
Choose Source Strength from the Display menu to see the source strength graph for this scenario. The graph shows the predicted averaged burn rate.

ALOHA estimates that the pool fire would last just under 2 and a half minutes. (In the Text Summary, ALOHA listed the burn duration as 2 minutes. ALOHA rounds duration estimates to the nearest whole minute on the Text Summary screen, but uses the more precise source strength value in its threat calculations.) The increase in burn rate for the first minute and a half is due to the growing puddle size as the chemical continues to leak from the tank.

Case Study on Congestion (Real Time Driver Information for Congestion Management)

Problem Statement: Congestion mitigation via Driver's decision making process at pre-trip planning and en route. Conduct a literature review on past and current research efforts on data collection methods and technologies, data screening and information synthesis, information dissemination, impact on driver's behavior, and active traffic management strategies.

Solution:



Smart Lanes: Minnesota DOT

Dynamic lane use control, dynamic speed limits, queue warning and adaptive ramp metering strategies.

Green arrows indicate a lane is open.

Yellow arrows provide warnings to proceed with caution.

Red X signifies the lane is closed-drivers should begin to merge out of the closed lane.

30% reduction in collision and 22% increase in roadway capacity.

Smart Lanes. Real Time. Real Choices. Real Safe.

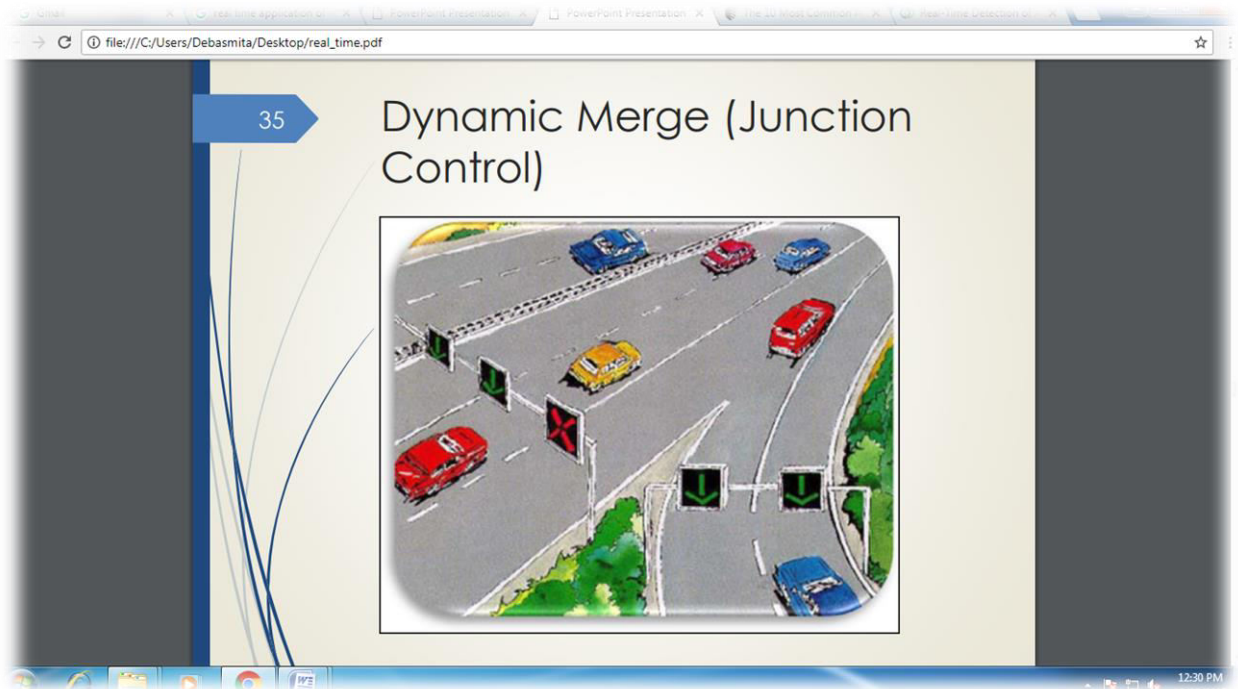


Impact of Real time information on drivers' behavior Drivers react to information in terms of route choice, trip time choice, travel speed, etc. One study showed that drivers receiving information with smartphones reacted to daily variation in travel times Another study showed the effectiveness of DMS in terms of speed reduction and crash rate reduction Some studies indicated that in-vehicle traffic information could be distracting due to information overload; other studies showed otherwise Several studies showed that real-time traffic information improves the overall performance of the road network.

ACTIVE TRAFFIC MANAGEMENT STRATEGIES Dynamic Lane Use (Shoulder Control) Dynamic opening of a shoulder lane to traffic or dynamic closure of travel lanes temporarily Ideal for congested and high transit volume freeways Shoulder running is based on traffic volume, travel speeds, incident presence Complementary ATM: variable speed limit, queue warning signs Benefits: Postponed onset of congestion× Increased capacity Improved trip reliability and travel times Challenges: Informing the public when shoulder running is allowed Possible bottlenecks at the end of the open shoulder segment

Dynamic Merge (Junction Control) Adjustment or closure of a lane or lanes upstream of an interchange. Ideal for congested freeway with high merging volumes Benefits: Delayed onset of congestion Increased capacity Improvement of traffic efficiency and reliability Challenges: Gaining public support Design and operations of the junction control area Data necessary:

Maximum capacity of upstream lanes, Traffic volumes on general purpose lanes and merging ramps, Travel speeds, Incident presence and location



Variable Speed Limits Changeable signs that reduce the speed limit in 5 mph increments downstream Ideal for congested freeways and areas prone to adverse weather Roadway or weather sensors are used with variable speed limits Benefits: Improved traffic flow Uniform traffic slowing or speed harmonization Few challenges with public support and operations of variable speed limits Enforcement issues Data required: Traffic volumes, Travel speeds, Local climate and weather conditions, Incident presence and location

Queue Warning and Dynamic Message Signs (DMS) Queue warning signs alert drivers of queues or backups downstream Loop detectors are used to help identify possible queues backing up Benefits: Reduced congestion Reduction of rear-end crashes and improved driver safety Challenges: Data quality and reliability Determining appropriate location for sensors Public awareness Operations and management Data required: Traffic volumes, Travel speeds, Travel times, Incident presence and locations.

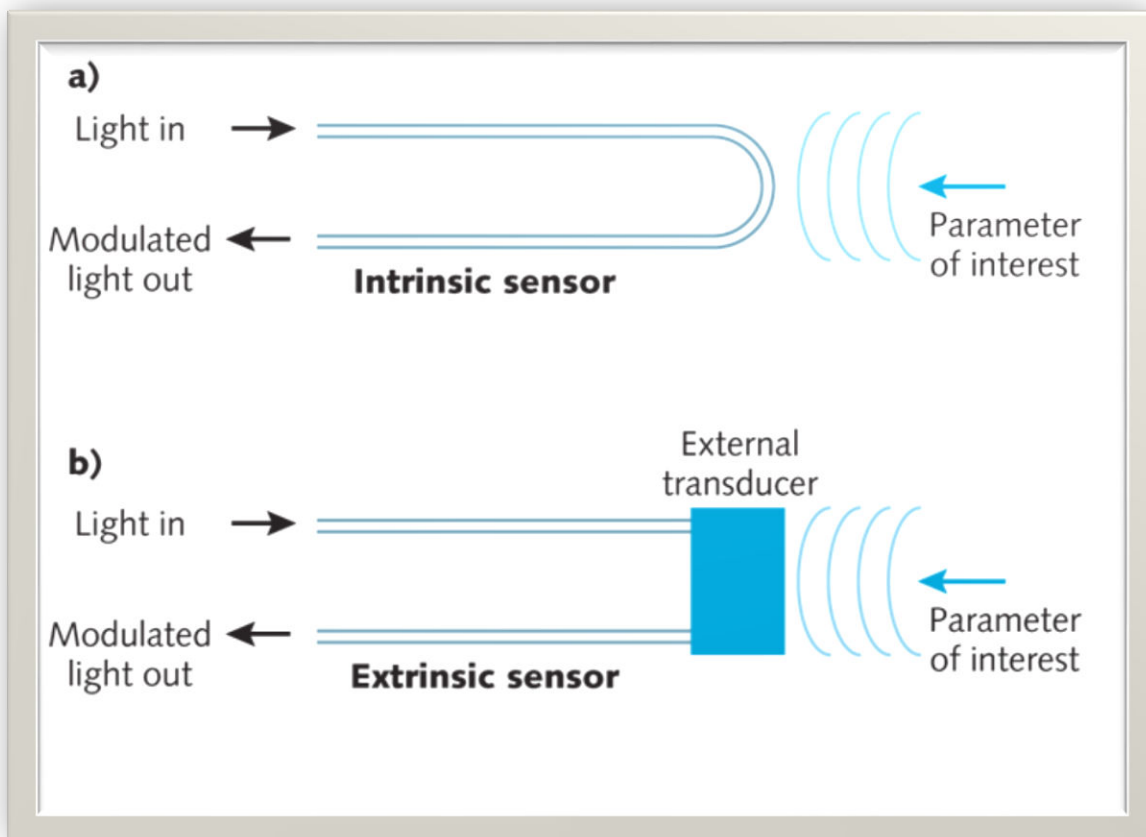
Dynamic Route Guidance (DRG) Develops optimal real-time distribution of traffic Different algorithms are used according to congestion levels and real-time traffic conditions DMS or in-vehicle systems are used to inform drivers with recommended routes Data required: Congestion information, Travel times.

Case Study on Optical fiber (sees growth as medical sensors)

Problem Statement: The intrinsic physical characteristics of optical fiber combined with its versatility in remote sensing make it an attractive technology for biomedical applications.

Solution: With a global population that's both growing and living longer, the world's healthcare providers are increasingly looking to advanced biomedical instrumentation to enable more efficient patient diagnosis, monitoring, and treatment. In this context, **biomedical sensing** applications of optical fiber are of growing importance. At the same time, recent advances in minimally invasive surgery (MIS) demand smaller disposable sensing catheters.

Endoscopic imaging applications of fiber-optics are well established, but the intrinsic physical characteristics of optical fibers also make them extremely attractive for biomedical sensing. Uncabled fibers (typically less than 250 μm diameter) can be inserted directly into hypodermic needles and catheters, so that their use can be both minimally invasive and highly localized—and fiber-optic sensors (FOS) made with them can perform remote multipoint and multiparameter sensing. Optical fibers are immune to electromagnetic interference (EMI), chemically inert, nontoxic, and intrinsically safe. Their use will not cause interference with the conventional electronics found in medical theaters. And, most importantly, the immunity of fibers to electromagnetic and radio frequency (RF) signals makes them ideal for real-time use during diagnostic imaging with MRI, CT, PET, or SPECT systems, as well as during thermal ablative treatments involving RF or microwave radiation.



There are two basic types of optical fiber sensors. Extrinsic devices (a) rely on a transducer, whereas intrinsic devices (b) do not.

Fiber-optic biomedical sensors

Optical fiber sensors comprise a light source, optical fiber, external transducer, and photodetector. They sense by detecting the modulation of one or more of the properties of light that is guided inside the fiber—intensity, wavelength, or polarization, for instance. The modulation is produced in a direct and repeatable fashion by an external perturbation caused by the physical parameter to be measured. The measurand of interest is inferred from changes detected in the light property.

Fiber-optic sensors can be intrinsic or extrinsic (see Fig. 1). In an intrinsic sensor, the light never leaves the fiber and the parameter of interest affects a property of the light propagating through the fiber by acting directly on the fiber itself. In an extrinsic sensor, the perturbation acts on a transducer and the optical fiber simply transmits light to and from the sensing location.

Many different fiber-optic sensing mechanisms have been demonstrated already for industrial applications^{1, 2}, and some for biomedical applications³⁻⁵ among which are fiber Bragg gratings (FBG), Fabry-Perot cavities or external fiber Fabry-Perot interferometer (EFPI) sensors, evanescent wave, Sagnac interferometer, Mach-Zehnder interferometer, microbend, photoelastic, and others. By far the most common, however, are based on EFPIs and FBGs. Spectroscopic sensors based on light absorption and fluorescence are also common. Biomedical FOS can be categorized into four main types: physical, imaging, chemical, and biological.

Physical sensors measure a variety of physiological parameters, like body temperature, blood pressure, and muscle displacement. Imaging sensors encompass both endoscopic devices for internal observation and imaging, as well as more advanced techniques such as optical coherence tomography (OCT) and photoacoustic imaging where internal scans and visualization can be made noninvasively. Chemical sensors rely on fluorescence, spectroscopic, and indicator techniques to identify and measure the presence of particular chemical compounds and metabolic variables (such as pH, blood oxygen, or glucose level). They detect specific chemical species for diagnostic purposes, as well as monitor the body's chemical reactions and activity. Biological sensors tend to be more complex and rely on biologic recognition reactions—such as enzyme-substrate, antigen-antibody, or ligand-receptor—to identify and quantify specific biochemical molecules of interest.

In terms of sensor development, the basic imaging sensors are the most developed. Fiber-optic sensors for measurement of physical parameters are the next most prevalent, and the least developed area in terms of successful products is sensors for biochemical sensing, even though many FOS concepts have been demonstrated

Latest product developments

One of the early pioneers of fiber-optic biomedical sensors, Camino Labs (San Diego, CA), in 1984 introduced into the medical market an intracranial pressure (ICP) sensor that has since become one of the most commonly used ICP monitoring systems in the world. The device is based on an intensity modulating fiber-optic scheme relying on a miniature bellows as the transducer.

Other sensor pioneers are Luxtron (Santa Clara, CA; now part of LumaSense) with its fluoroptic temperature sensor, and FISO (Quebec City, QC, Canada) which has positioned itself as a leading supplier of medical fiber-optic pressure and temperature sensors. FISO's sensors are

based on EFPI devices interrogated with white-light interferometry. Among a new generation of companies are Opsens, Neoptix (both in Quebec City, QC, Canada), and Samba Sensors (Västra Frölunda, Sweden). By far, the most common medical FOS on the market are temperature and pressure monitors, but a handful of other diverse sensors and instruments does exist (see Table 2). As costs fall and new sensing techniques are developed, it's likely that the number and

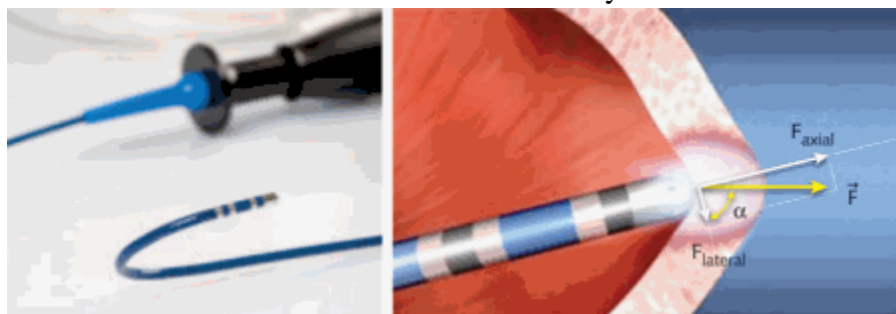
diversity of biomedical FOS will increase.

Examples of commercial fiber-optic biomedical sensors by type

Parameter	Company
Temperature	Fiso, LumaSense, Neoptix, OpSens, RJC
Pressure	Fiso, Maquet, OpSens, Samba Sensors, RJC
Coronary imaging	InfraRedx
Oxygenation	ISS
Pulse oximeter	Nonin
Blood flowmeter	ADInstruments
Shape/position	Hansen Medical, Intuitive Surgical, Luna, Measurand, Technobis
Force	EndoSense
EKG/EEG	Srico

Among the latest development efforts are shape-sensing systems that use arrays of FBGs disposed along multicore, singlemode fibers. The FBGs will shift peak wavelengths in response to the strain and curvature stress produced during bending. The fiber arrays help determine the precise position and shape of medical tools and robotic arms used during MIS. Companies pursuing such developments are Hansen Medical (Mountain View, CA), Intuitive Surgical (Sunnyvale, CA), Luna Innovations (Roanoke, VA), Measurand (Fredericton, NB, Canada), and Technobis (Uitgeest, the Netherlands).

Another relevant new FOS product in precertification trials is the EndoSense (Geneva, Switzerland) TactiCath force-sensing catheter. Fiber Bragg grating sensors are mounted on the tip of an intra-aortic catheter that also serves as a laser-ablation delivery probe for the treatment of atrial fibrillation. The FBGs detect the force exerted against the heart wall by the stress induced on them (see Fig. 3). Force control is essential for delivering appropriate laser ablation pulses needed to produce lesions that are induced in the heart walls to reduce abnormal electric activity.



fiber-optic intra-aortic force sensing catheter probe enables real-time monitoring of the force exerted against the heart wall by the catheter.

Case Study on CRC

Problem Statement: A CRC Verilog description module for a hard real time communication protocol in a control distributed system.

Solution: This paper is a brief summary of a project developed and designed by SIDA and University of Valencia, supported by GAME. The objective of this project is the consecution of a robust and reliable industrial control system using HDL in its definition, with better performance, easier maintenance and lower cost than one based on automates.

The fast evolution and progress in the design methodology with hardware description languages have done possible them to be applied easily in a lot of industrial system designs. The point of this paper is just related with a typical feature on industrial environments, such noise and electrical perturbations, and how using HDL that problems are overcome.

A CRC Verilog description module for a hard real time communication protocol in a control distributed system.

The whole industrial system designed has two parts, on the one hand a central part that controls every task of the system, and on the other hand a part controlling the peripheral components which interface directly with the industrial environment. Both parts have been implemented with specific application integrated circuits (ASICs). Further on we will refer to them as central ASIC and peripheral ASIC. These ASICs have been fully developed with Top-down technology explained later, from a hardware description language like Verilog-XL. The central unit (central ASIC) is the manager and controller of the whole system, capable to execute the control algorithms and to implement efficiently the hard real time communications with the peripheral units (peripheral ASICs) through message passing mechanism using a master-slave model. One of the main factors to take into account, is just the noise environment and how to avoid them using a well designed messages with CRC and modulated with noise immune mechanism such FSK.

Communication module. CRC block The physical layer used is a coaxial cable of 50 ohms and BICMOS drivers for bidirectional communications with bus topology which enables to enlarge the system. The communication protocol is a master/slave protocol. The central unit requests information to the units connected to it and these units answer just when they have been requested. An interruption routine programmed in the central unit every 512 us sends the following types of information frames :

Out of order, this frame disables the peripheral at the same time. • Check, it forces the peripheral to answer with the current state of its inputs and it is sent from central unit waiting 138,8 us since the bus is idle • Digital, it sends the value that the peripherals should have at the digital outputs • Mixed, the same as the digital but including digitalized analog values

A failure prevention mechanism in the peripheral devices is introduced, at this level of protocol definition, by the polling routine using the check frame. This routine checks all the peripheral devices when the central unit is not carrying out any access to any devices. The steps needed to generate the information exchanged are the following: the sender builds the frame with a defined format, generates the CRC , explained later, of the frame and after codes it in Manchester and modulate in FSK

Sender: generate the frame=> calculates CRC=> codes Manchester=> modulates FSK=> sends

On the other side, the receiver demodulates from FSK, decodes Manchester and verifies with CRC and if no error is found it gets the information. In other cases the receiver waits to the retransmission by the sender time out.

Receiver: demodulates FSK=> decodes Manchester=> calculates CRC=> receives

The synchronisation employed in this protocol is implicitly in the Manchester code, thus the system could be considered asynchronous. The clock information is included in the binary information, synchronising with the rising and falling edges of the signal.

Case Study on Topology (cell phones to actually map out the topology of indoor spaces)

Problem Statement: This paper discusses using cell phones to actually map out the topology of indoor spaces. I also know one can use topology maps for automated robot navigation. Lots of machine learning applications as well. Another cool application is in the world of chemistry where one can discuss the shape of molecules by an analysis of the topology of a related graph. There is also an application for medical imaging software and technology. I'm pretty sure one can find an example of the application of topology to basically every field of the sciences.

Solution: Today's solutions provide location-aware services in applications that are oriented towards localization in maps that give a metric perception of environments; thus, maps resemble their real environment. However, we believe that this metric-oriented approach is not the optimum approach for a scalable implementation of indoor location-aware services used in mobile devices. In this sense, topological mapping approaches bring an abstraction to that metric information and are more likely to deal with low accurate measurements. In addition, they could be implemented with techniques that use less a priori information and in systems with limited computational power. This might be a good approach to improve scalability in such systems. These two approaches are well studied in robotics and their development has been made based on the SLAM (simultaneous localization and mapping) methodology, for instance. While metric maps try to precisely represent the world by measuring and relating distances, as it is proposed in (Yiguang et al., 2010), the main idea behind the topological approach is to provide distinctiveness for global localization and mapping within the environment as it is done in (Beeson et al., 2005) or in (Sogo et al., 2001). More specifically, topological maps provide a sketch map with labelled places and abstract paths between them, in contrast to the metric maps that try to sketch all the features within the environment with geometric precision. A topological map approach can be used also in location-aware services oriented towards human utilization. For instance, humans would not require geometric locations to navigate in indoor environments and could easily do it through semantic locations and connections between them. The same idea can be applied to many intelligent systems which make use of location-aware services. Our premise is to depart from a system with very little information about the environment. No map and topology is known a priori. Thus, its goal must be to achieve localization in the indoor environment and through that localization start building a topological map of the environment along the time and through a collaborative fashion among users.

In order to materialize this idea, we have to emphasize the available sensor technologies that can be used to perform localization in indoor environments. The first technology that comes to mind when thinking about localization is GPS (Global Positioning Systems). However, this technology has a poor performance in indoor environments due to the lack of satellite coverage. Some works have been made also with cellular networks, namely using GSM (Global System for Mobile Communication), but it suffers from the same effects as referred to GPS. Nevertheless, better performances can be achieved through the use of a priori data about the environment, situation

which we intend to minimize in our research. One of the most explored technologies to perform localization in indoor environments is WiFi Wireless LAN. This is a technology widely implemented in public infrastructures and that is also built-in in today's ordinary mobile devices. However, this kind of technology suffers from significant signal attenuation effects in indoor environments, such as: multipath; refractions; reflections; scattering and shadowing. These problems are normally overcome through fingerprinting approaches, as in GPS or in GSM. However, several techniques can be performed without fingerprinting methods and using Wi-Fi WLANs. These methods rely on simple lateration or angulation techniques or even doing an on-line calibration phase similar to fingerprinting. Another technology that can be used for localization purposes and that is widely spread in mobile devices is Bluetooth. Despite similar to WiFi in some aspects, Bluetooth measurements are only able after establishing a connection between devices. This is usually overcome through learning algorithms, such as Artificial Neural Networks to estimate device positions. Another approach relies on using other sensor technologies that are also highly available on today's mobile devices, such as accelerometers, magnetometers and gyroscopes. Such an approach usually performs dead-reckoning of devices when the users are on the move through acceleration and orientation measures. We are specifically interested in studying the potential of available technology to support easy and practical inference of topological maps for indoor applications. We want to provide some guidelines to select mobile-enabled sensors to base topological map inference methods, and build such maps through localization of devices in indoor environments in a collaborative fashion. With the localization estimates of many devices we expect to achieve a better basis for performing topological map inference methods. Firstly, we analyse the best techniques and technologies to perform localization with mobile devices, which can provide us with a better basis for topological map inference through simple, low-cost and common infrastructures. Secondly, we show how such a system is implemented in those devices and make an analysis of the preliminary implementation and results using multiple devices.

Related Work: Several works have been developed in order to achieve localization of mobile devices in indoor environments. Topological map inference has been made mainly in the robotics field, focusing on the SLAM methodology, as we mentioned before. Nevertheless, we must first focus on localization issues for mobile devices.

Scene Analysis Scene analysis makes use of a predefined data set that maps observed features into object locations. One example of static scene analysis is the RADAR system, presented in (Bahl and Padmanabhan, 2000). This technique is considered one of the best alternatives to simple triangulation or lateration methods made without a priori fingerprinting. In theory, the static scene analysis can be performed with all the measurements or features available. But for indoor localization purposes, the most common metric used is RSSI (received signal strength indicator). Other metrics can also be achieved and used, for example AoA (angle of arrival) or ToA (time of Arrival), or even the use of image analysis for navigation, which can be done also through mobile platforms with built-in cameras. Scene analysis is usually performed in two

phases: one training phase that is usually made offline, and where normally a database is built containing pattern variations of one or more features in known locations; and, another phase when the location estimation is done through a relationship analysis with data originated in the first phase. Deterministic and Probabilistic models are normally used to perform the matching in the second phase. The main advantages of scene analysis concern the fact that location of “objects” can be inferred using passive observations. However, this kind of method requires previous analysis of scenes, so that a comparison can be performed to achieve location.

Problem Statement: Case study on Computer Viruses in UNIX Environment

Viruses On UNIX Operating System

virus works by replicating inside programs. Each infected program then viruses can be used to spread an attack throughout a system or network. A spreads the virus further. The UNIX protection mechanisms are inadequate for virus defense. Unix has the reputation of being " not so buggy", and of being a good maintainer of system sanctity via good protection mechanisms. A few years ago tom duff created a very persistent UNIX virus. the virus lived in the slack space at the end of the executable, and changed the entry point to itself. When the program was executed, it searched the current directory, subdirectories, /bin/usr/bin for writable, uninfected files and then infected them if there was enough space. A channel(or a mechanism) used by virus to spread is called a vector. There is no dearth of potential vectors on UNIX(for example, buffer overflow vulnerabilities).

How To Hide Viruses On UNIX?

There are several candidates on UNIX for being a virus runtime environment. Similarly, there are several places for a virus to hide on UNIX:

1. The UNIX shells Shell scripts are a powerful way to program. Unix shells are ubiquitous, accessible, and provide homogeneity across otherwise heterogeneous systems(for example, with differing application binary interfaces). Shell scripts are simple text files, and lend themselves easily to be modified.
2. Binary executables A virus writer may want his virus to hide in a binary executable, for obvious reasons(such files provide more obscure hiding places, and are often more " active"). However, given the diverse nature of different UNIX platforms(including different executable formats), modifying an executable might be rather painful to implement For example, the feasibility and difficulty of injecting a stream of instructions into an executable to modify program execution would depend on the file format. The executable and linking format(ELF) is meant to provide developers with a set of binary interface definitions that extend across multiple platforms. ELF is indeed used on several platforms, and is flexible enough to be manipulated creatively. A virus could attach viral code to an ELF file, and re-route control-flow so as to include the viral code during execution.
3. Jingle bell: a simple virus in C Jingle bell is an extremely simple minded virus written in c that attaches itself to an executable by appending the latter to itself and recording the offset. This process repeats itself. The virus infects the first executable found, if any, on its command line. Other infection policies could be programmed too. The virus would some how need to be introduced in the system, through a downloaded binary, for example.

Detection & Prevention Virus On UNIX

Detection: Viruses can reliably be detected by using an integrity• shell instead of the normal UNIX shell. Integrity shells for UNIX have been in use for several years, and work transparently to the normal user.

Prevention: Viruses can not be completely prevented under UNIX or any other modern operating system except by eliminating sharing, or eliminating programming. This is almost never feasible in a modern UNIX system.

Cure: Viruses are best cured with on-line backups which automate the restoration of corrupted information under an integrity shell. Off-line backups are also effective in many cases, as long as good detection is in place. Without good detection, backups are ineffective against viruses.

Viruses Available On UNIX Environment

- 1- Viruses are spread in tftp to obtain password files if possible use tftpd in place of tftp.
- 2- Programs such as telnet, su and login are being replaced by viruses programs.
- 3- Viruses have been leaving files and directories with both usual and unusual names such as "mail.", ".." these files may be found in the home directories of compromised accounts or in /tmp or /usr/tmp.
- 4- Viruses may be introduced through the introduction of scripts that set the user id to root . than use the "find" command to verify that all such scripts are authorized. 5-The viruses may attempt to leave an additional account on the system to be used at a later time. Therefore, check password file to assure that all accounts are authorized and properly passworded.
- 5- The viruses may be used terminal on the network to access other hosts on the network.
- 6- The send mail function has several problems which viruses can exploit.
- 7- There is also a well-known problem with finger in less recent versions of UNIX. A virus continue to exploit this vulnerability.

Conclusion& suggestion

Conclusion

- 1- A virus attacks specific file types.
- 2- A virus manipulates a program to execute tasks unintentionally.
- 3- An infected program produces more viruses.
- 4- An infected program may run without error for a long time.
- 5- Viruses can modify themselves and may possibly escape detection this way.

Suggestion

The increasing reliance by business on use of data processing systems and the increasing use of networks and communications facilities to build distributed systems have resulted in a strong requirement for computer and network security. computer security relates to mechanisms inside and related to a single computer system. The principal object is to protect the data resources of that system. Network security deals with the protection of data and messages that are communicated. Another important to prevention the virus is access control. The purpose access control is to ensure that only authorized users have access to particular system and its individual resources and that access modification of particular portion of data are limited to authorized individuals and programs. These viruses exploit vulnerabilities in system software either to gain unauthorized access to information or to degrade system service.

Case study on Interprocess communication in UNIX

Pipes

- The `pipe()` function:

```
#include <unistd.h>  
  
int pipe(int fd[2]);  
  
Returns: 0 if OK, -1 on error
```

- After calling `pipe()`:

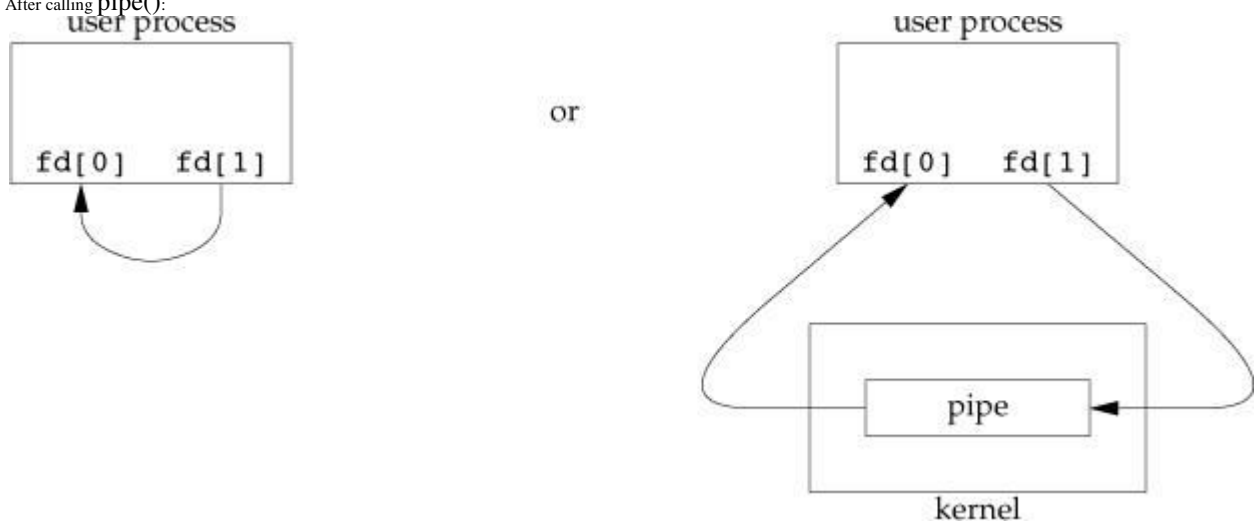


Figure 15.2, APUE

- After calling `pipe()` and then `fork()`:

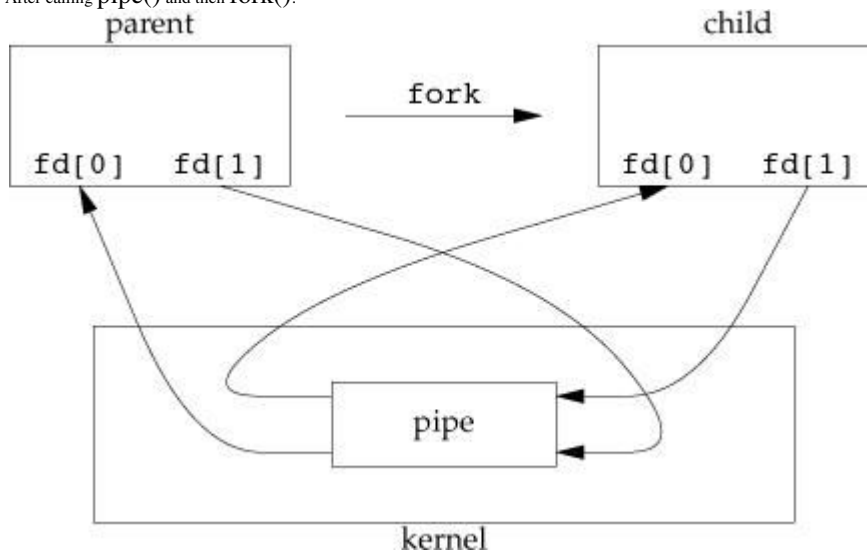


Figure 15.3, APUE

- Example: copying file to a pager program

```
#include "apue.h"  
#include <sys/wait.h>  
  
#define DEF_PAGER "/bin/more" /* default pager program */  
  
int main(int argc, char *argv[])  
{  
    int    n;
```

```

• int    fd[2];
• pid_t  pid;
• char   *pager, *argv0;
• char   line[MAXLINE];
• FILE   *fp;
•
• if (argc != 2)
•     err_quit("usage: a.out <pathname>");
•
• if ((fp = fopen(argv[1], "r")) == NULL)
•     err_sys("can't open %s", argv[1]);
• if (pipe(fd) < 0)
•     err_sys("pipe error");
•
• if ((pid = fork()) < 0) {
•     err_sys("fork error");
•
• } else if (pid > 0) {    /* parent */
•
•     close(fd[0]);      /* close read end */
•
•     /* parent copies argv[1] to pipe */
•     while (fgets(line, MAXLINE, fp) != NULL) {
•         n = strlen(line);
•         if (write(fd[1], line, n) != n)
•             err_sys("write error to pipe");
•     }
•     if (ferror(fp))
•         err_sys("fgets error");
•
•     close(fd[1]); /* close write end of pipe for reader */
•
•     if (waitpid(pid, NULL, 0) < 0)
•         err_sys("waitpid error");
•     exit(0);
•
• } else {    /* child */
•
•     close(fd[1]); /* close write end */
•
•     if (fd[0] != STDIN_FILENO) {
•         if (dup2(fd[0], STDIN_FILENO) != STDIN_FILENO)
•             err_sys("dup2 error to stdin");
•         close(fd[0]);    /* don't need this after dup2 */
•     }
•
•     /* get arguments for execl() */
•     if ((pager = getenv("PAGER")) == NULL)
•         pager = DEF_PAGER;
•     if ((argv0 = strrchr(pager, '/')) != NULL)
•         argv0++;    /* step past rightmost slash */
•     else
•         argv0 = pager;    /* no slash in pager */
•
•     if (execl(pager, argv0, (char *)0) < 0)
•         err_sys("execl error for %s", pager);

```

- }
- exit(0);
- }

XSI IPC

They share common naming and interface scheme:

- XSI Message queues

- int msgget(key_t key, int flag);
- int msgctl(int msqid, int cmd, struct msqid_ds *buf);
- int msgsnd(int msqid, const void *ptr, size_t nbytes, int flag);
- ssize_t msgrcv(int msqid, void *ptr, size_t nbytes, long type, int flag);

- XSI Semaphores

- int semget(key_t key, int nsems, int flag);
- int semctl(int semid, int semnum, int cmd, ... /* union semun arg */);
- int semop(int semid, struct sembuf semoparray[], size_t nops);

- XSI Shared memory

- int shmget(key_t key, size_t size, int flag);
- int shmctl(int shmid, int cmd, struct shmid_ds *buf);
- void *shmat(int shmid, const void *addr, int flag);
- int shmdt(const void *addr);

And they all suck...

1. Hard to clean-up because there is no reference counting
 - pipes get automatically removed when last process terminates
 - data left in a FIFO is removed when last process terminates
2. Hard to use
 - complex and inelegant interfaces that don't fit into UNIX file system paradigm
 - stupid naming scheme: IPC identifiers, keys, and *project IDs* – *are you serious?*

They have been widely used for lack of alternatives. Fortunately we do have alternatives these days:

- Instead of XSI message queues, use:
 - UNIX domain sockets
 - POSIX message queues (still not widely available, so not covered in APUE; see [man 7 mq_overview](#))
- Instead of XSI semaphores, use:
 - POSIX semaphores
- Instead of XSI shared memory, use:
 - memory mapping using `mmap()`

Memory-mapped I/O

- `mmap()` function:
 - `#include <sys/mman.h>`
 -
 - `void *mmap(void *addr, size_t len, int prot, int flag, int fd, off_t off);`
 -
 - Returns: starting address of mapped region if OK, `MAP_FAILED` on error
- Example of a memory-mapped file:

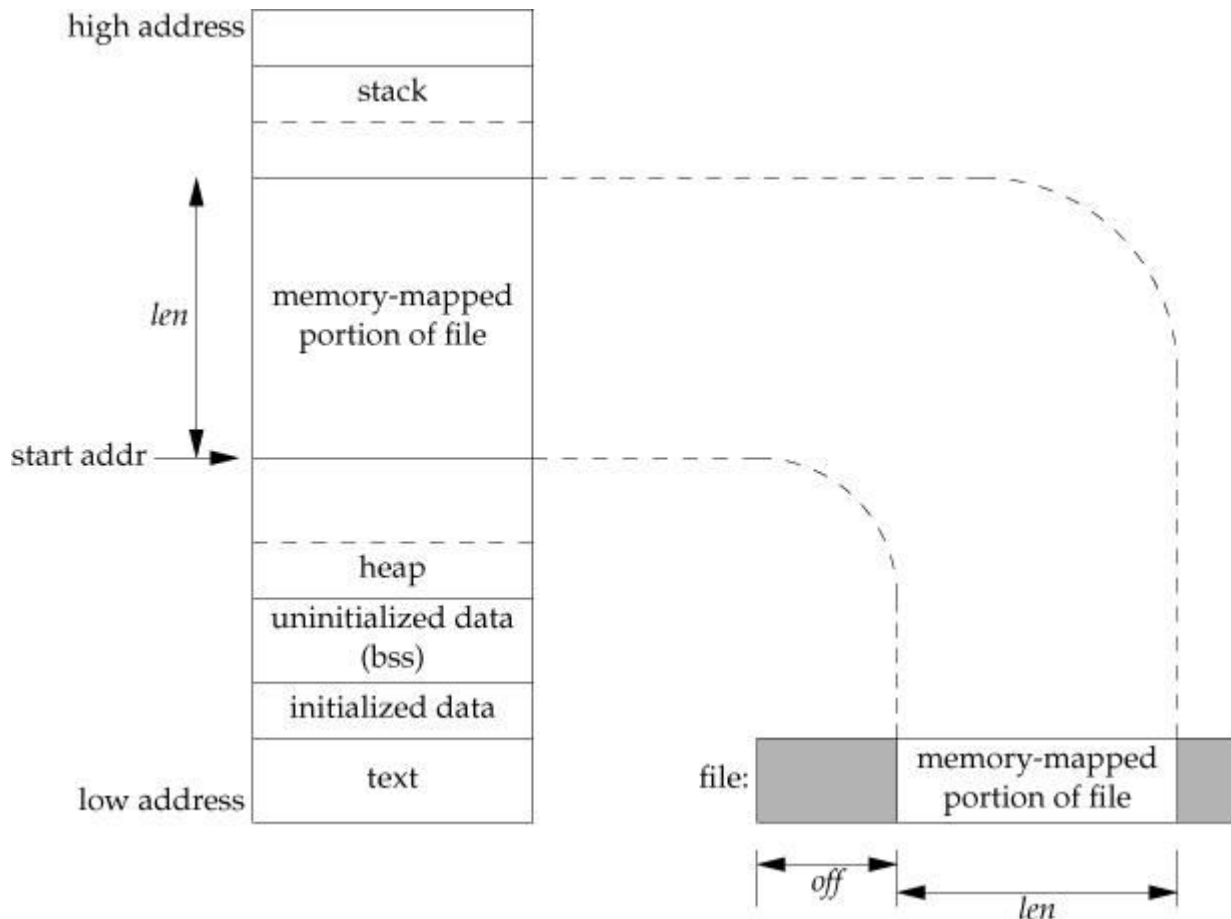


Figure 14.26, APUE

- Memory mapping `/dev/zero` for shared memory (Figure 15.33, APUE):

```

• #include "apue.h"
• #include <fcntl.h>
• #include <sys/mman.h>
•
• #define NLOOPS    1000
• #define SIZE      sizeof(long)  /* size of shared memory area */
•
• static int
• update(long *ptr)
• {
•     return((*ptr)++);  /* return value before increment */
• }
•
• int
• main(void)
• {
•     int    fd, i, counter;
•     pid_t  pid;
•     void   *area;
•
•     if ((fd = open("/dev/zero", O_RDWR)) < 0)
•         err_sys("open error");
•     if ((area = mmap(0, SIZE, PROT_READ | PROT_WRITE, MAP_SHARED, fd, 0)) == MAP_FAILED)
•         err_sys("mmap error");
•     close(fd);      /* can close /dev/zero now that it's mapped */
•
•     TELL_WAIT();

```



```

•
•
• if ((pid = fork()) < 0) {
•     err_sys("fork error");
• } else if (pid > 0) {           /* parent */
•     for (i = 0; i < NLOOPS; i += 2) {
•         if ((counter = update((long *)area)) != i)
•             err_quit("parent: expected %d, got %d", i, counter);
•
•         TELL_CHILD(pid);
•         WAIT_CHILD();
•     }
• } else {                       /* child */
•     for (i = 1; i < NLOOPS + 1; i += 2) {
•         WAIT_PARENT();
•
•         if ((counter = update((long *)area)) != i)
•             err_quit("child: expected %d, got %d", i, counter);
•
•         TELL_PARENT(getppid());
•     }
• }
•
• exit(0);
• }

```

- Anonymous memory mapping

Same as `/dev/zero` mapping, but more portable and more convenient.

Change Figure 15.33 as follows:

1. remove `open("/dev/zero", ...)` and `close(fd)`
 2. change `mmap` call to:
3. `if ((area = mmap(0, SIZE, PROT_READ | PROT_WRITE, MAP_ANON | MAP_SHARED, -1, 0)) == MAP_FAILED)`

POSIX Semaphores

- What is semaphore?
- Binary vs. Counting semaphores
- Creating, opening, closing, and removing **named** POSIX semaphores:

```

• #include <semaphore.h>
•
• sem_t *sem_open(const char *name, int oflag, ... /* mode_t mode,
•     unsigned int value */);
•     Returns: Pointer to semaphore if OK, SEM_FAILED on error
•
• int sem_close(sem_t *sem);
•     Returns: 0 if OK, -1 on error
•
• int sem_unlink(const char *name);
•     Returns: 0 if OK, -1 on error

```

- Initializing and destroying **unnamed** POSIX semaphores:

```

• #include <semaphore.h>
•
• int sem_init(sem_t *sem, int pshared, unsigned int value);
•     Returns: 0 if OK, -1 on error

```

-
- `int sem_destroy(sem_t *sem);`
- Returns: 0 if OK, -1 on error

- Using POSIX semaphores:

Decrement the value of semaphores:

```
#include <semaphore.h>

int sem_trywait(sem_t *sem);
int sem_wait(sem_t *sem);
    Both return: 0 if OK, -1 on error
```

Decrement with bounded waiting:

```
#include <semaphore.h>
#include <time.h>

int sem_timedwait(sem_t *restrict sem,
    const struct timespec *restrict tsptr);
    Returns: 0 if OK, -1 on error
```

Increment the value of semaphores:

```
#include <semaphore.h>

int sem_post(sem_t *sem);
    Returns: 0 if OK, -1 on error
```

Case study on Process scheduling in unix

If there are several runnable jobs, the operating system has to decide which job to run next, a process known as *Process Scheduling*.

In the old days, when computers ran batch jobs, this was not an issue. The computer operator simply submitted the jobs in the order that they were delivered to him or her, and each job ran to completion. We can call this algorithm First come first served, or FIFO (first in first out).

However, even this primitive system had problems. Suppose there are five jobs waiting to be run. Four of the five jobs will take about ten seconds each to run, and one will take ten minutes, but the ten minute job was submitted first. In a FIFO system, the four fast jobs will all be held up for a long time by a large job that happened to be delivered first.

In a batch system, this was not serious since jobs were never interactive. However, if we knew ahead of time how long each job would take, we could maximize throughput. In fact, some computer centers in the '60s could actually do this. When a user submitted a job, he or she was also asked to specify an estimated run time. The operator would then allow a job to run only for that amount of time (or perhaps a few seconds longer). This was important, because even then, programmers could write programs with infinite loops. If a program exceeded its estimated run time, the operator killed it.

This permitted the operator to run jobs using a *shortest job first* algorithm. As the name implies, instead of running jobs in the order that they are delivered, the operator would search through all available jobs and run that job which had the shortest run time. This is provably the fastest job scheduling algorithm. A simple example will demonstrate this.

Suppose four jobs arrived at about the same, but not exactly the same, time. We happen to know exactly how long each job will take. Here are the run times of the four jobs, in the order that they arrived.

Job One 25
Job Two 10
Job Three 20
Job Four 15

If the jobs are run with a FIFO algorithm, here are the total times to completion for each of the four jobs (assuming that it takes no time to load a job).

Job One 25
Job Two 35
Job Three 55
Job Four 70

The average time to completion was 46.25 seconds $((25 + 35 + 55 + 70) / 4)$.

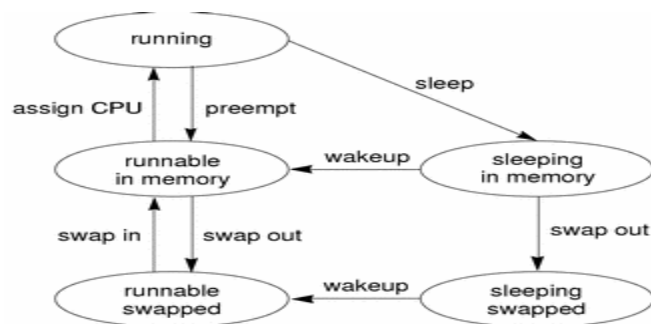
If the jobs are run shortest job first, (Job Two, Job Four, Job Three, Job One) here are the total times to completion of the four jobs.

Job One 70
Job Two 10
Job Three 45
Job Four 25

It still takes 70 seconds to run all four jobs, but the average time to completion for a job was 37.5 seconds $((70 + 10 + 45 + 25) / 4)$.

Aside: Asking users to estimate the run time of their jobs put them in somewhat of a bind, because often they did not have an exact guess. If they submitted a high guess, their job would almost certainly run to completion, but it might be delayed by the operator. On the other hand, if they submitted a somewhat lower time estimate, the operator would start running it sooner, but there was a greater chance that it would time out before completing.

Process scheduling on a modern multiprogramming operating system is far more complex. Recall our state diagram for the states of a process



Case study on Memory Management in unix

The memory management subsystem is one of the most important parts of the operating system. Since the early days of computing, there has been a need for more memory than exists physically in a system. Strategies have been developed to overcome this limitation and the most successful of these is virtual memory. Virtual memory makes the system appear to have more memory than it actually has by sharing it between competing processes as they need it.

Virtual memory does more than just make your computer's memory go further. The memory management subsystem provides:

Large Address Spaces

The operating system makes the system appear as if it has a larger amount of memory than it actually has. The virtual memory can be many times larger than the physical memory in the system,

Protection

Each process in the system has its own virtual address space. These virtual address spaces are completely separate from each other and so a process running one application cannot affect another. Also, the hardware virtual memory mechanisms allow areas of memory to be protected against writing. This protects code and data from being overwritten by rogue applications.

Memory Mapping

Memory mapping is used to map image and data files into a processes address space. In memory mapping, the contents of a file are linked directly into the virtual address space of a process.

Fair Physical Memory Allocation

The memory management subsystem allows each running process in the system a fair share of the physical memory of the system,

Shared Virtual Memory

Although virtual memory allows processes to have separate (virtual) address spaces, there are times when you need processes to share memory. For example there could be several processes in the system running the bash command shell. Rather than have several copies of bash, one in each processes virtual address space, it is better to have only one copy in physical memory and all of the processes running bash share it. Dynamic libraries are another common example of executing code shared between several processes.

Shared memory can also be used as an Inter Process Communication (IPC) mechanism, with two or more processes exchanging information via memory common to all of them. Linux supports the Unix™ System V shared memory IPC.

An Abstract Model of Virtual Memory

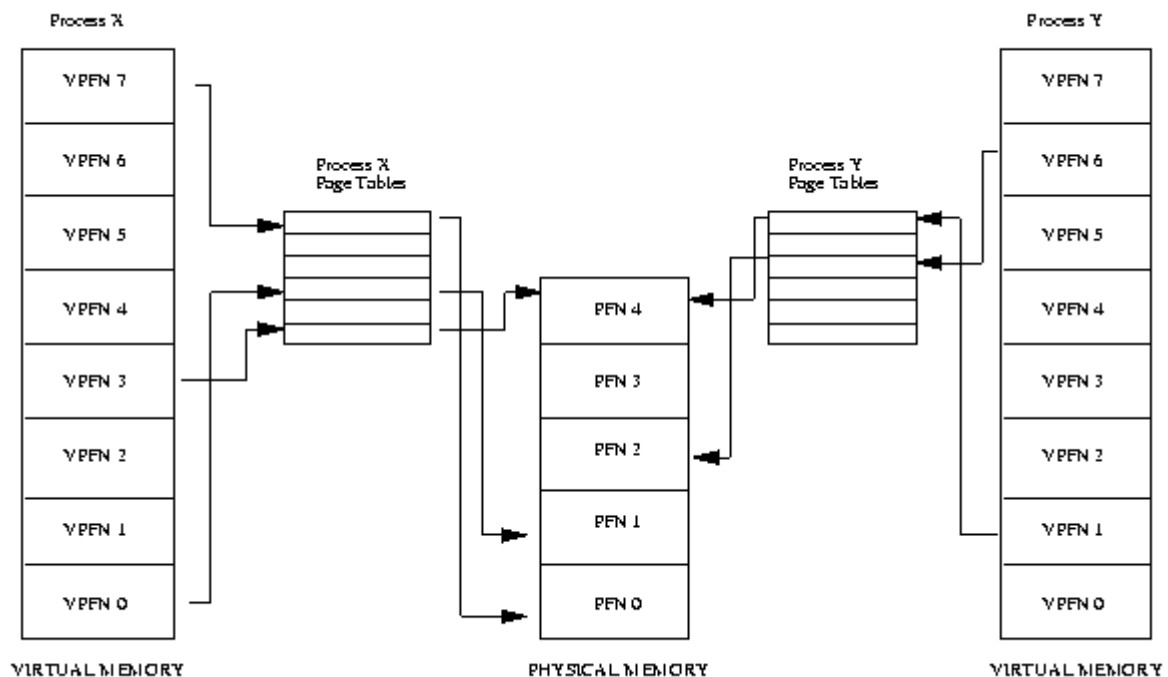


Figure 3.1: Abstract model of Virtual to Physical address mapping

Before considering the methods that Linux uses to support virtual memory it is useful to consider an abstract model that is not cluttered by too much detail.

As the processor executes a program it reads an instruction from memory and decodes it. In decoding the instruction it may need to fetch or store the contents of a location in memory. The processor then executes the instruction and moves onto the next instruction in the program. In this way the processor is always accessing memory either to fetch instructions or to fetch and store data.

In a virtual memory system all of these addresses are virtual addresses and not physical addresses. These virtual addresses are converted into physical addresses by the processor based on information held in a set of tables maintained by the operating system.

To make this translation easier, virtual and physical memory are divided into handy sized chunks called *pages*. These pages are all the same size, they need not be but if they were not, the system would be very hard to administer. Linux on Alpha AXP systems uses 8 Kbyte pages and on Intel x86 systems it uses 4 Kbyte pages. Each of these pages is given a unique number; the page frame number (PFN).

In this paged model, a virtual address is composed of two parts; an offset and a virtual page frame number. If the page size is 4 Kbytes, bits 11:0 of the virtual address contain the offset and bits 12 and above are the virtual page frame number. Each time the processor encounters a virtual address it must extract the offset and the virtual page frame number. The processor must translate the virtual page frame number into a physical one and then access the location at the correct offset into that physical page. To do this the processor uses *page tables*.

Figure 3.1 shows the virtual address spaces of two processes, process X and process Y, each with their own page tables. These page tables map each processes virtual pages into physical pages in memory. This shows that process X's virtual page frame number 0 is mapped into memory in physical page frame number 1 and that process Y's virtual page frame number 1 is mapped into physical page frame number 4. Each entry in the theoretical page table contains the following information:

- Valid flag. This indicates if this page table entry is valid,
- The physical page frame number that this entry is describing,
- Access control information. This describes how the page may be used. Can it be written to? Does it contain executable code?

The page table is accessed using the virtual page frame number as an offset. Virtual page frame 5 would be the 6th element of the table (0 is the first element).

To translate a virtual address into a physical one, the processor must first work out the virtual addresses page frame number and the offset within that virtual page. By making the page size a power of 2 this can be easily done by masking and shifting. Looking again at Figures 3.1 and assuming a page size of $0x2000$ bytes (which is decimal 8192) and an address of $0x2194$ in process Y's virtual address space then the processor would translate that address into offset $0x194$ into virtual page frame number 1.

The processor uses the virtual page frame number as an index into the processes page table to retrieve its page table entry. If the page table entry at that offset is valid, the processor takes the physical page frame number from this entry. If the entry is invalid, the process has accessed a non-existent area of its virtual memory. In this case, the processor cannot resolve the address and must pass control to the operating system so that it can fix things up.

Just how the processor notifies the operating system that the correct process has attempted to access a virtual address for which there is no valid translation is specific to the processor. However the processor delivers it, this is known as a *page fault* and the operating system is notified of the faulting virtual address and the reason for the page fault.

Assuming that this is a valid page table entry, the processor takes that physical page frame number and multiplies it by the page size to get the address of the base of the page in physical memory. Finally, the processor adds in the offset to the instruction or data that it needs.

Using the above example again, process *Y*'s virtual page frame number 1 is mapped to physical page frame number 4 which starts at $0x8000$ ($4 \times 0x2000$). Adding in the $0x194$ byte offset gives us a final physical address of $0x8194$.

By mapping virtual to physical addresses this way, the virtual memory can be mapped into the system's physical pages in any order. For example, in Figure [3.1](#) process *X*'s virtual page frame number 0 is mapped to physical page frame number 1 whereas virtual page frame number 7 is mapped to physical page frame number 0 even though it is higher in virtual memory than virtual page frame number 0. This demonstrates an interesting byproduct of virtual memory; the pages of virtual memory do not have to be present in physical memory in any particular order.

3.1.1 Demand Paging

As there is much less physical memory than virtual memory the operating system must be careful that it does not use the physical memory inefficiently. One way to save physical memory is to only load virtual pages that are currently being used by the executing program. For example, a database program may be run to query a database. In this case not all of the database needs to be loaded into memory, just those data records that are being examined. If the database query is a search query then it does not make sense to load the code from the database program that deals with adding new records. This technique of only loading virtual pages into memory as they are accessed is known as demand paging.

When a process attempts to access a virtual address that is not currently in memory the processor cannot find a page table entry for the virtual page referenced. For example, in Figure [3.1](#) there is no entry in process *X*'s page table for virtual page frame number 2 and so if process *X* attempts to read from an address within virtual page frame number 2 the processor cannot translate the address into a physical one. At this point the processor notifies the operating system that a page fault has occurred.

If the faulting virtual address is invalid this means that the process has attempted to access a virtual address that it should not have. Maybe the application has gone wrong in some way, for example writing to random addresses in memory. In this case the operating system will terminate it, protecting the other processes in the system from this rogue process.

If the faulting virtual address was valid but the page that it refers to is not currently in memory, the operating system must bring the appropriate page into memory from the image on disk. Disk access takes a long time, relatively speaking, and so the process must wait quite a while until the page has been fetched. If there are other processes that could run then the operating system will select one of them to run. The fetched page is written into a free physical page frame and an entry for the virtual page frame number is added to the processes page table. The process is then restarted at the machine instruction where the memory fault occurred. This time the virtual memory access is made, the processor can make the virtual to physical address translation and so the process continues to run.

Linux uses demand paging to load executable images into a processes virtual memory. Whenever a command is executed, the file containing it is opened and its contents are mapped into the processes

virtual memory. This is done by modifying the data structures describing this processes memory map and is known as *memory mapping*. However, only the first part of the image is actually brought into physical memory. The rest of the image is left on disk. As the image executes, it generates page faults and Linux uses the processes memory map in order to determine which parts of the image to bring into memory for execution.

3.1.2 Swapping

If a process needs to bring a virtual page into physical memory and there are no free physical pages available, the operating system must make room for this page by discarding another page from physical memory.

If the page to be discarded from physical memory came from an image or data file and has not been written to then the page does not need to be saved. Instead it can be discarded and if the process needs that page again it can be brought back into memory from the image or data file.

However, if the page has been modified, the operating system must preserve the contents of that page so that it can be accessed at a later time. This type of page is known as a *dirty* page and when it is removed from memory it is saved in a special sort of file called the swap file. Accesses to the swap file are very long relative to the speed of the processor and physical memory and the operating system must juggle the need to write pages to disk with the need to retain them in memory to be used again.

If the algorithm used to decide which pages to discard or swap (the *swap algorithm* is not efficient then a condition known as *thrashing* occurs. In this case, pages are constantly being written to disk and then being read back and the operating system is too busy to allow much real work to be performed. If, for example, physical page frame number 1 in Figure [3.1](#) is being regularly accessed then it is not a good candidate for swapping to hard disk. The set of pages that a process is currently using is called the *working set*. An efficient swap scheme would make sure that all processes have their working set in physical memory.

Linux uses a Least Recently Used (LRU) page aging technique to fairly choose pages which might be removed from the system. This scheme involves every page in the system having an age which changes as the page is accessed. The more that a page is accessed, the younger it is; the less that it is accessed the older and more stale it becomes. Old pages are good candidates for swapping.

3.1.3 Shared Virtual Memory

Virtual memory makes it easy for several processes to share memory. All memory access are made via page tables and each process has its own separate page table. For two processes sharing a physical page of memory, its physical page frame number must appear in a page table entry in both of their page tables.

Figure [3.1](#) shows two processes that each share physical page frame number 4. For process *X* this is virtual page frame number 4 whereas for process *Y* this is virtual page frame number 6. This illustrates an interesting point about sharing pages: the shared physical page does not have to exist at the same place in virtual memory for any or all of the processes sharing it.

3.1.4 Physical and Virtual Addressing Modes

It does not make much sense for the operating system itself to run in virtual memory. This would be a nightmare situation where the operating system must maintain page tables for itself. Most multi-purpose processors support the notion of a physical address mode as well as a virtual address mode.

Physical addressing mode requires no page tables and the processor does not attempt to perform any address translations in this mode. The Linux kernel is linked to run in physical address space.

The Alpha AXP processor does not have a special physical addressing mode. Instead, it divides up the memory space into several areas and designates two of them as physically mapped addresses. This kernel address space is known as KSEG address space and it encompasses all addresses upwards from *0xffffc00000000000*. In order to execute from code linked in KSEG (by definition, kernel code) or access data there, the code must be executing in kernel mode. The Linux kernel on Alpha is linked to execute from address *0xffffc0000310000*.

Case study on Programming in windows vista

Programming Windows Vista

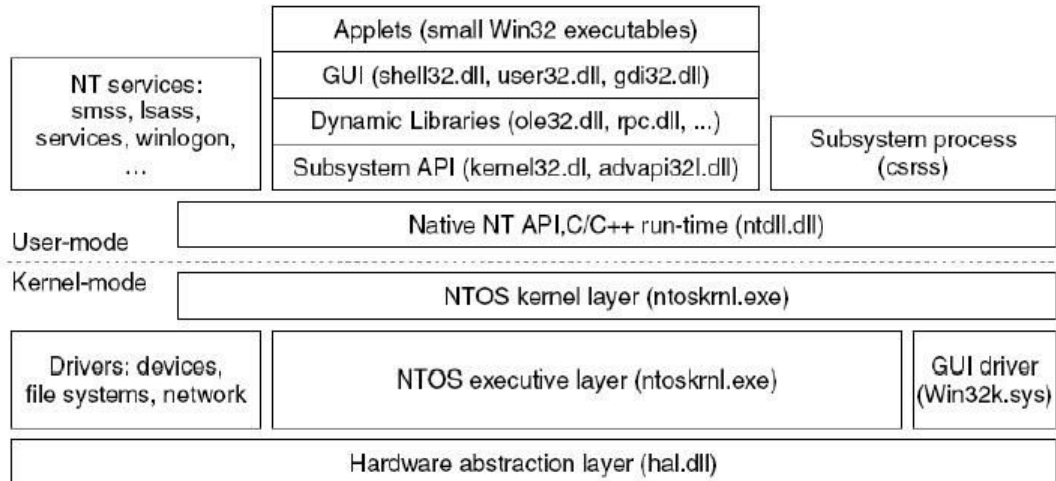


Figure 11-6. The programming layers in Windows.

Programming Windows Vista (2)

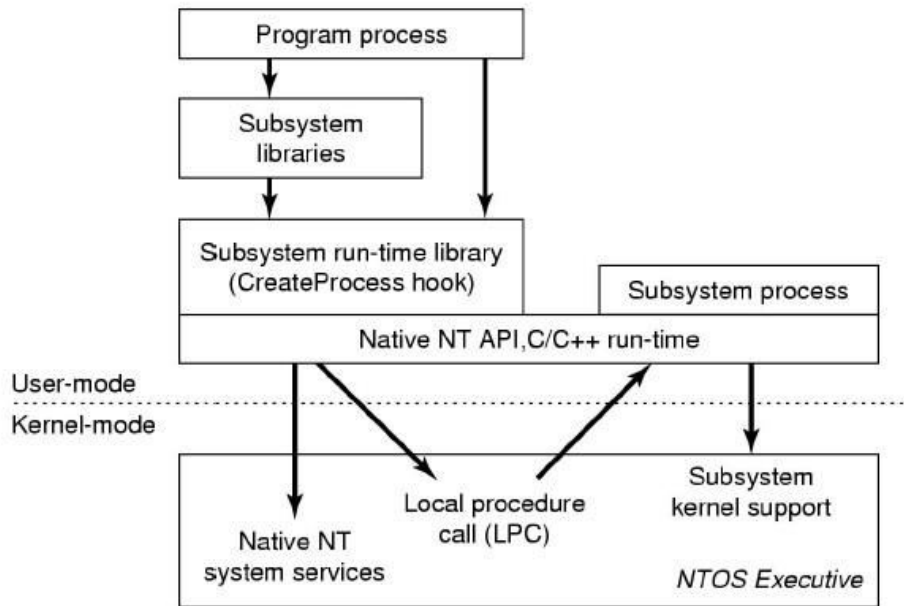


Figure 11-7. The components used to build NT subsystems.

The Native NT Application Programming Interface (1)

Object category	Examples
Synchronization	Semaphores, mutexes, events, IPC ports, I/O completion queues
I/O	Files, devices, drivers, timers
Program	Jobs, processes, threads, sections, tokens
Win32 GUI	Desktops, application callbacks

The Native NT Application Programming Interface (2)

NtCreateProcess(&ProcHandle, Access, SectionHandle, DebugPortHandle, ExceptPortHandle, ...)
NtCreateThread(&ThreadHandle, ProcHandle, Access, ThreadContext, CreateSuspended, ...)
NtAllocateVirtualMemory(ProcHandle, Addr, Size, Type, Protection, ...)
NtMapViewOfSection(SectHandle, ProcHandle, Addr, Size, Protection, ...)
NtReadVirtualMemory(ProcHandle, Addr, Size, ...)
NtWriteVirtualMemory(ProcHandle, Addr, Size, ...)
NtCreateFile(&FileHandle, FileNameDescriptor, Access, ...)
NtDuplicateObject(srcProcHandle, srcObjHandle, dstProcHandle, dstObjHandle, ...)

Figure 11-9. Examples of native NT API calls that use handles to manipulate objects across process boundaries.

The Win32 Application Programming Interface

Win32 call	Native NT API call
CreateProcess	NtCreateProcess
CreateThread	NtCreateThread
SuspendThread	NtSuspendThread
CreateSemaphore	NtCreateSemaphore
ReadFile	NtReadFile
DeleteFile	NtSetInformationFile
CreateFileMapping	NtCreateSection
VirtualAlloc	NtAllocateVirtualMemory
MapViewOfFile	NtMapViewOfSection
DuplicateHandle	NtDuplicateObject
CloseHandle	NtClose

Figure 11-10. Examples of Win32 API calls and the native NT API calls that they wrap.

The Windows Registry (1)

Hive file	Mounted name	Use
SYSTEM	HKLM\SYSTEM	OS configuration information, used by kernel
HARDWARE	HKLM\HARDWARE	In-memory hive recording hardware detected
BCD	HKLM\BCD*	Boot Configuration Database
SAM	HKLM\SAM	Local user account information
SECURITY	HKLM\SECURITY	Local user account and other security information
DEFAULT	HKEY_USERS\DEFAULT	Default hive for new users
NTUSER.DAT	HKEY_USERS<user id>	User-specific hive, kept in home directory
SOFTWARE	HKLM\SOFTWARE	Application classes registered by COM
COMPONENTS	HKLM\COMPONENTS	Manifests and dependencies for sys. components

Figure 11-11. The registry hives in Windows Vista. HKLM is a short-hand for *HKEY_LOCAL_MACHINE*.

Operating System Structure

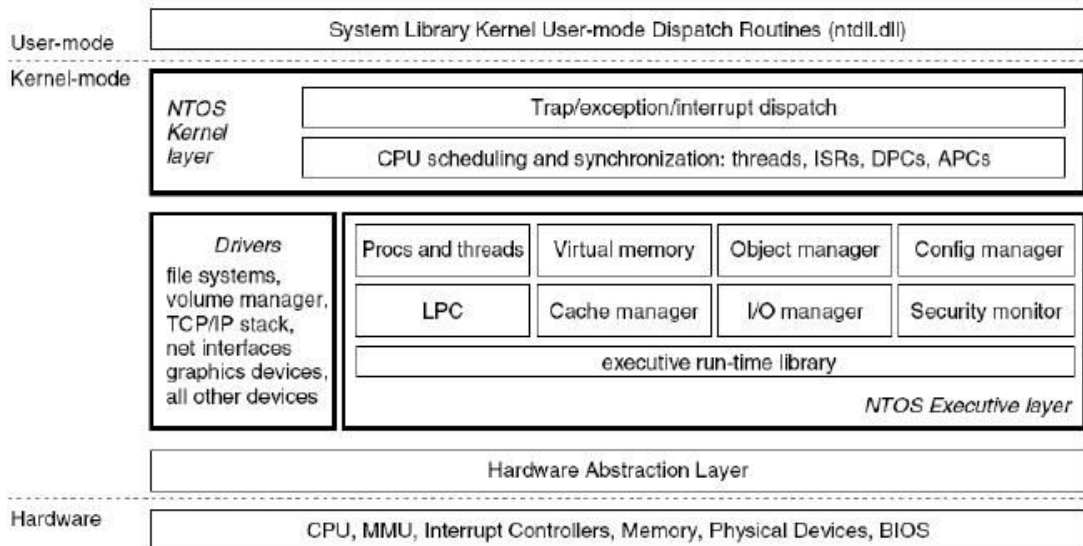


Figure 11-13. Windows kernel-mode organization.

The Windows Registry (2)

Win32 API function	Description
RegCreateKeyEx	Create a new registry key
RegDeleteKey	Delete a registry key
RegOpenKeyEx	Open a key to get a handle to it
RegEnumKeyEx	Enumerate the subkeys subordinate to the key of the handle
RegQueryValueEx	Look up the data for a value within a key

Case study on MFC programming in windows

In essence, MFC is a SDK interface, a library consisting in a set of classes that act as wrappers around portions of the Windows API, so that C++ programmers may program Windows using some concepts of the object-oriented programming (OOP) paradigm and the C++ language (the Win32 API is based on C, as seen in C and Win32 API Section of the book). One should learn the Win32 API or at least have some ideas since some functions are absent from the MFC and would help you to better understand the SDK.

Some tools, such as Microsoft Visual Studio, are capable of automatically generating large amounts of MFC skeleton code for use in a project. Because of this, most MFC tutorials or reference materials will teach the subject using the automated Visual Studio tools, and leave out some of the gritty details. In this book where possible we try to be neutral.

MFC was first oriented mostly for enterprise-level programming projects, created in an age most code was done in C and Object Oriented Programming was only in the realm of Smalltalk.

Since the release of Visual Studio 6.0 and the MFC 6.0 little was known of the future support to the MFC since the company was favoring the .NET Framework. Version 7.0, 7.1 and 8.0 were mostly extensions to support the new OSs and to aid developers in migrating to the new framework. Since then information on the future of the MFC could be only extracted from Steve Teixeira, Microsoft Corporation, June 2005 paper - **MFC: Visual Studio 2005 and Beyond**, on the release of Visual Studio 2008 Service Pack 1, Microsoft seems to once again be actively supporting the MFC.

Many users today find it acceptable for a low complexity program to have a memory footprint of 30-80Mb (this is common in Java or .Net applications), low response times or "outside of your control" applications like the internet now provides. It is therefore debatable if the impact of use of MFC in small applications outweighs the benefits the libraries provides. Most of the software made specifically for Windows today uses MFC.

You should prefer the Win32 API SDK, or an alternative wrapper for it, if you do not intend to:

1. **Make use of a complex GUI, use the document/view architecture or complex controls.**
This will increase the use of system resources (memory use, exe and install size).
2. **Use other libraries that depend on the MFC.**
3. **Have a complex install for your application.**
To distribute MFC-Based project you must build it with static MFC libraries or distribute your project with the needed MFC dlls. There is no guarantee that your customer has the required dlls for your program. Old MFC-Based programs must work with new MFC versions. They should but don't do it always. Your customer will not be very happy if after installing your project some of his old software products begin hanging.

MFC and C++

The MFC design principle is an attempt for simplification. The wrapper classes were designed so to simplify some tasks and automates others. Because of those facts, however, a certain amount of fine-tunable control was lost from the raw Win32 API or excessive automation was archived. The MFC has been recognized as having serious design flaws and inconsistencies and has not been actively maintained. The C++ language and best practices have evolved and today this constitutes a barrier for the utilization of the framework.

As MFC predates the STL standardization in to the C++ language, it implements its own versions of the STL containers, not as complete and even inconsistent, this simplistic solutions the MFC implementations tend to be faster, however you should prefers to use the STL when ever you can, it will make the code more C++ standard and permit easier portability in converting the code to multi-platform.

Multiple Inheritance

The MFC class library does not use Multiple Inheritance and was not designed with full support for Multiple Inheritance.

Since most MFC classes derive from CObject using Multiple Inheritance will be cause problems of ambiguity (any reference to CObject member functions will have to be disambiguated). Static member functions, including operator new and operator delete must also be disambiguated.

The best option is to avoid the use of Multiple Inheritance with MFC but take a look at Using C++ Multiple Inheritance with MFC (msdn.microsoft.com) for the needed information on how to bypass the limitations.

MFC Conventions

The MFC uses the Hungarian notation. It uses prefixes, like "m_" to indicate a member variable or "p" to indicate a pointer, and the rest of the name is normally written out in CamelCase (the first letter of each word is capitalized).

CObject as the Root for most MFC Classes

All the significant classes in MFC derive from the CObject class. The CObject does not have any member data, but does have some default functionality.

Using MFC

MFC requires header files that are separate from the standard <windows.h> header file. The core of the MFC system requires the inclusion of <afxwin.h>. Other header files that are of some use are <afxext.h> (for MFC extensions), and <afxcmn.h> (for the MFC common dialog boxes).

Simply changing the header files, unfortunately, is still not enough. The MFC DLL libraries must be linked to by the project, because the DLL files contain the class definitions that will be used throughout every program. To use MFC, you must link to the MFC libraries

stdafx.h

stdafx.h is the standard include for MFC projects - that is, if you create a new MFC project, a **stdafx.h** will automatically be created for you. It will include all the rest of the necessary MFC header files.

theApp

```
extern CYourAppClass theApp;
```

Use in the header file of your application class and then include it wherever you need to use **theApp**.

You could try the *AfxGetApp* function to get a pointer to **theApp**, an efficient method of accessing members of your application is to make a pointer to **theApp** a member variable of the class which needs it -- for example:

```
class CMyDialog : public CDialog
{
    // other class stuff here...

    // Attributes
public:
    CMdiApp* m_pApp;
```

```
};
```

and make sure you initialize *m_pApp* in the constructor or else will be accessing a **NULL** pointer.

```
CMyDialog::CMyDialog(CWnd* pParent /*!=NULL*/): CDialog(CMyDialog::IDD, pParent)
{
    //{{AFX_DATA_INIT(CMyDialog)
    //}} AFX_DATA_INIT
    // Outside the special-format comments above...
    m_pApp = (CMdiApp*)AfxGetApp( );
}
```

and voila! Now any time you need access to your application, you got it!

```
m_pApp->m_nMemberVar;
m_pApp->MemberFunction(nParam1, strParam2);
```

Basic MFC Program

We will outline here a basic MFC program that will create a simple window, but won't handle any user input. From this basic outline, we will be able to tackle more difficult subjects.

```
#include <afxwin.h> //basic MFC include

//class derived from CFrameWnd, which is derived from CWnd
class Basic_Window:public CFrameWnd
{
    public:
    Basic_Window()
    {
        Create(NULL, "Basic MFC Window");
        // In some cases you might want to use
        // Create(NULL, _T(":Basic MFC Window"));
    }
};

//class derived from CWinApp, which is the main instance of our application
class MyProgram:public CWinApp
{
    //a pointer to our window class object
    Basic_Window *bwnd;
    public:
```

```

//this is essentially our "entry point"
BOOL InitInstance()
{
    bwnd = new Basic_Window();
    m_pMainWnd = bwnd;
    m_pMainWnd->ShowWindow(1);
    return 1;
}
};

//the program class instance pointer
MyProgram theApp;

```

Case study on Interprocess Communications in windows

The Windows operating system provides mechanisms for facilitating communications and data sharing between applications. Collectively, the activities enabled by these mechanisms are called *interprocess communications* (IPC). Some forms of IPC facilitate the division of labor among several specialized processes. Other forms of IPC facilitate the division of labor among computers on a network.

Typically, applications can use IPC categorized as clients or servers. A *client* is an application or a process that requests a service from some other application or process. A *server* is an application or a process that responds to a client request. Many applications act as both a client and a server, depending on the situation. For example, a word processing application might act as a client in requesting a summary table of manufacturing costs from a spreadsheet application acting as a server. The spreadsheet application, in turn, might act as a client in requesting the latest inventory levels from an automated inventory control application.

After you decide that your application would benefit from IPC, you must decide which of the available IPC methods to use. It is likely that an application will use several IPC mechanisms. The answers to these questions determine whether an application can benefit by using one or more IPC mechanisms.

- Should the application be able to communicate with other applications running on other computers on a network, or is it sufficient for the application to communicate only with applications on the local computer?

- Should the application be able to communicate with applications running on other computers that may be running under different operating systems (such as 16-bit Windows or UNIX)?
- Should the user of the application have to choose the other applications with which the application communicates, or can the application implicitly find its cooperating partners?
- Should the application communicate with many different applications in a general way, such as allowing cut-and-paste operations with any other application, or should its communications requirements be limited to a restricted set of interactions with specific other applications?
- Is performance a critical aspect of the application? All IPC mechanisms include some amount of overhead.
- Should the application be a GUI application or a console application? Some IPC mechanisms require a GUI application.

The following IPC mechanisms are supported by Windows:

- [Clipboard](#)
- [COM](#)
- [Data Copy](#)
- [DDE](#)
- [File Mapping](#)
- [Mailslots](#)
- [Pipes](#)
- [RPC](#)
- [Windows Sockets](#)

Using the Clipboard for IPC

The clipboard acts as a central depository for data sharing among applications. When a user performs a cut or copy operation in an application, the application puts the selected data on the clipboard in one or more standard or application-defined formats. Any other application can then retrieve the data from the clipboard, choosing from the available formats that it understands. The clipboard is a very loosely coupled exchange medium, where applications need only agree on the data format. The applications can reside on the same computer or on different computers on a network.

Key Point: All applications should support the clipboard for those data formats that they understand. For example, a text editor or word processor should at least be able to produce and accept clipboard data in pure text format. For more information, see [Clipboard](#).

Using COM for IPC

Applications that use OLE manage *compound documents*—that is, documents made up of data from a variety of different applications. OLE provides services that make it easy for applications to call on other applications for data editing. For example, a word processor that uses OLE could embed a graph from a spreadsheet. The user could start the spreadsheet automatically from within the word processor by choosing the embedded chart for editing. OLE takes care of starting the spreadsheet and presenting the graph for editing. When the user quit the spreadsheet, the graph would be updated in the original word processor document. The spreadsheet appears to be an extension of the word processor.

The foundation of OLE is the Component Object Model (COM). A software component that uses COM can communicate with a wide variety of other components, even those that have not yet been written. The components interact as objects and clients. Distributed COM extends the COM programming model so that it works across a network.

Key Point: OLE supports compound documents and enables an application to include embedded or linked data that, when chosen, automatically starts another application for data editing. This enables the application to be extended by any other application that uses OLE. COM objects provide access to an object's data through one or more sets of related functions, known as *interfaces*. For more information, see COM and ActiveX Object Services.

Using Data Copy for IPC

Data copy enables an application to send information to another application using the **WM_COPYDATA** message. This method requires cooperation between the sending application and the receiving application. The receiving application must know the format of the information and be able to identify the sender. The sending application cannot modify the memory referenced by any pointers.

Key Point: Data copy can be used to quickly send information to another application using Windows messaging. For more information, see [Data Copy](#).

Using DDE for IPC

DDE is a protocol that enables applications to exchange data in a variety of formats. Applications can use DDE for one-time data exchanges or for ongoing exchanges in which the applications update one another as new data becomes available.

The data formats used by DDE are the same as those used by the clipboard. DDE can be thought of as an extension of the clipboard mechanism. The clipboard is almost always used for a one-time response to a user command, such as choosing the Paste command from a menu. DDE is also usually initiated by a user command, but it often continues to function without further user interaction. You can also define custom DDE data formats for special-purpose IPC between applications with more tightly coupled communications requirements.

DDE exchanges can occur between applications running on the same computer or on different computers on a network.

Key Point: DDE is not as efficient as newer technologies. However, you can still use DDE if other IPC mechanisms are not suitable or if you must interface with an existing application that only supports DDE. For more information, see [Dynamic Data Exchange](#) and [Dynamic Data Exchange Management Library](#).

Using a File Mapping for IPC

File mapping enables a process to treat the contents of a file as if they were a block of memory in the process's address space. The process can use simple pointer operations to examine and modify the contents of the file. When two or more processes access the same file mapping, each process receives a pointer to memory in its own address space that it can use to read or modify the contents of the file. The processes must use a synchronization object, such as a semaphore, to prevent data corruption in a multitasking environment.

You can use a special case of file mapping to provide *named shared memory* between processes. If you specify the system swapping file when creating a file-mapping object, the file-mapping object is treated as a shared memory block. Other processes can access the same block of memory by opening the same file-mapping object.

File mapping is quite efficient and also provides operating-system–supported security attributes that can help prevent unauthorized data corruption. File mapping can be used only between processes on a local computer; it cannot be used over a network.

Key Point: File mapping is an efficient way for two or more processes on the same computer to share data, but you must provide synchronization between the processes. For more information, see [File Mapping](#) and [Synchronization](#).

Using a Mailslot for IPC

Mailslots provide one-way communication. Any process that creates a mailslot is a *mailslot server*. Other processes, called *mailslot clients*, send messages to the mailslot server by writing a message to its mailslot. Incoming messages are always appended to the mailslot. The mailslot saves the messages until the mailslot server has read them. A process can be both a mailslot server and a mailslot client, so two-way communication is possible using multiple mailslots.

A mailslot client can send a message to a mailslot on its local computer, to a mailslot on another computer, or to all mailslots with the same name on all computers in a specified network domain. Messages broadcast to all mailslots on a domain can be no longer than 400 bytes, whereas messages sent to a single mailslot are limited only by the maximum message size specified by the mailslot server when it created the mailslot.

Key Point: Mailslots offer an easy way for applications to send and receive short messages. They also provide the ability to broadcast messages across all computers in a network domain. For more information, see [Mailslots](#).

Using Pipes for IPC

There are two types of pipes for two-way communication: anonymous pipes and named pipes. *Anonymous pipes* enable related processes to transfer information to each other. Typically, an anonymous pipe is used for redirecting the standard input or output of a child process so that it can exchange data with its parent process. To exchange data in both directions (duplex operation), you must create two anonymous pipes. The parent process writes data to one pipe using its write handle, while the child process reads the data from that pipe using its read handle. Similarly, the child process writes data to the other pipe and the parent process reads from it. Anonymous pipes cannot be used over a network, nor can they be used between unrelated processes.

Named pipes are used to transfer data between processes that are not related processes and between processes on different computers. Typically, a named-pipe server process creates a named pipe with a well-known name or a name that is to be communicated to its clients. A named-pipe client process that knows the name of the pipe can open its other end, subject to access restrictions specified by named-pipe server process. After both the server and client have connected to the pipe, they can exchange data by performing read and write operations on the pipe.

Key Point: Anonymous pipes provide an efficient way to redirect standard input or output to child processes on the same computer. Named pipes provide a simple programming interface for transferring data between two processes, whether they reside on the same computer or over a network. For more information, see [Pipes](#).

Using RPC for IPC

RPC enables applications to call functions remotely. Therefore, RPC makes IPC as easy as calling a function. RPC operates between processes on a single computer or on different computers on a network.

The RPC provided by Windows is compliant with the Open Software Foundation (OSF) Distributed Computing Environment (DCE). This means that applications that use RPC are able to communicate with applications running with other operating systems that support DCE. RPC automatically supports data conversion to account for different hardware architectures and for byte-ordering between dissimilar environments.

RPC clients and servers are tightly coupled but still maintain high performance. The system makes extensive use of RPC to facilitate a client/server relationship between different parts of the operating system.

Key Point: RPC is a function-level interface, with support for automatic data conversion and for communications with other operating systems. Using RPC, you can create high-performance, tightly coupled distributed applications. For more information, see [Microsoft RPC Components](#).

Using Windows Sockets for IPC

Windows Sockets is a protocol-independent interface. It takes advantage of the communication capabilities of the underlying protocols. In Windows Sockets 2, a socket handle can optionally be used as a file handle with the standard file I/O functions.

Windows Sockets are based on the sockets first popularized by Berkeley Software Distribution (BSD). An application that uses Windows Sockets can communicate with other socket

implementation on other types of systems. However, not all transport service providers support all available options.

Key Point: Windows Sockets is a protocol-independent interface capable of supporting current and emerging networking capabilities. For more information, see [Windows Sockets 2](#).

Case study on dialog box in windows programming

A dialog box is a temporary window an application creates to retrieve user input. An application typically uses dialog boxes to prompt the user for additional information for menu items. A dialog box usually contains one or more controls (child windows) with which the user enters text, chooses options, or directs the action.

Windows also provides predefined dialog boxes that support common menu items such as **Open** and **Print**. Applications that use these menu items should use the common dialog boxes to prompt for this user input, regardless of the type of application.

In This Section

Name	Description
About Dialog Boxes	Discusses using dialog boxes in the user interface for your applications.
Dialog Box Programming Considerations	This overview discusses some programming considerations concerning dialog boxes.
Using Dialog Boxes	You use dialog boxes to display information and prompt for input from the user.
Dialog Box Reference	The API Reference
Common Dialog Box Library	Discusses using the common dialog boxes in the user interface for your applications.

Dialog Box Functions

Name	Description
CreateDialog	Creates a modeless dialog box from a dialog box template resource.
CreateDialogIndirect	Creates a modeless dialog box from a dialog box template in memory.
CreateDialogIndirectParam	Creates a modeless dialog box from a dialog box template in memory. Before displaying the dialog box, the function passes an application-defined value to the dialog box procedure as the <i>lParam</i> parameter of

	the WM_INITDIALOG message. An application can use this value to initialize dialog box controls.
CreateDialogParam	Creates a modeless dialog box from a dialog box template resource. Before displaying the dialog box, the function passes an application-defined value to the dialog box procedure as the <i>lParam</i> parameter of the WM_INITDIALOG message. An application can use this value to initialize dialog box controls.
DefDlgProc	Calls the default dialog box window procedure to provide default processing for any window messages that a dialog box with a private window class does not process.
DialogBox	Creates a modal dialog box from a dialog box template resource. DialogBox does not return control until the specified callback function terminates the modal dialog box by calling the EndDialog function.
DialogBoxIndirect	Creates a modal dialog box from a dialog box template in memory. DialogBoxIndirect does not return control until the specified callback function terminates the modal dialog box by calling the EndDialog function.
DialogBoxIndirectParam	Creates a modal dialog box from a dialog box template in memory. Before displaying the dialog box, the function passes an application-defined value to the dialog box procedure as the <i>lParam</i> parameter of the WM_INITDIALOG message. An application can use this value to initialize dialog box controls.
DialogBoxParam	Creates a modal dialog box from a dialog box template resource. Before displaying the dialog box, the function passes an application-defined value to the dialog box procedure as the <i>lParam</i> parameter of the WM_INITDIALOG message. An application can use this value to initialize dialog box controls.
<i>DialogProc</i>	An application-defined callback function used with the CreateDialog and DialogBox families of functions. It processes messages sent to a modal or modeless dialog box. The DLGPROC type defines a pointer to this callback function. <i>DialogProc</i> is a placeholder for the application-defined function name.
EndDialog	Destroys a modal dialog box, causing the system to end any processing for the dialog box.
GetDialogBaseUnits	Retrieves the system's dialog base units, which are the average width and height of characters in the system font. For dialog boxes that use the system font, you can use these values to convert between dialog template units, as specified in dialog box templates, and pixels. For dialog boxes that do not use the system font, the conversion from dialog template units to pixels depends on the font used by the dialog box.
GetDlgCtrlID	Retrieves the identifier of the specified control.
GetDlgItem	Retrieves a handle to a control in the specified dialog box.

GetDlgItemInt	Translates the text of a specified control in a dialog box into an integer value.
GetDlgItemText	Retrieves the title or text associated with a control in a dialog box.
GetNextDlgGroupItem	Retrieves a handle to the first control in a group of controls that precedes (or follows) the specified control in a dialog box.
GetNextDlgTabItem	Retrieves a handle to the first control that has the WS_TABSTOP style that precedes (or follows) the specified control.
IsDialogMessage	Determines whether a message is intended for the specified dialog box and, if it is, processes the message.
MapDialogRect	Converts the specified dialog box units to screen units (pixels). The function replaces the coordinates in the specified RECT structure with the converted coordinates, which allows the structure to be used to create a dialog box or position a control within a dialog box.
MessageBox	Displays a modal dialog box that contains a system icon, a set of buttons, and a brief application-specific message, such as status or error information. The message box returns an integer value that indicates which button the user clicked.
MessageBoxEx	Creates, displays, and operates a message box. The message box contains an application-defined message and title, plus any combination of predefined icons and push buttons. The buttons are in the language of the system user interface.
MessageBoxIndirect	Creates, displays, and operates a message box. The message box contains application-defined message text and title, any icon, and any combination of predefined push buttons.
SendDlgItemMessage	Sends a message to the specified control in a dialog box.
SetDlgItemInt	Sets the text of a control in a dialog box to the string representation of a specified integer value.
SetDlgItemText	Sets the title or text of a control in a dialog box.

Dialog Box Messages

Name	Description
DM_GETDEFID	Retrieves the identifier of the default push button control for a dialog box.
DM_REPOSITION	Repositions a top-level dialog box so that it fits within the desktop area. An application can send this message to a dialog box after resizing it to ensure that the entire dialog box remains visible.
DM_SETDEFID	Changes the identifier of the default push button for a dialog box.

Dialog Box Notifications

Name	Description
WM_CTLCOLORDLG	Sent to a dialog box before the system draws the dialog box. By responding to this message, the dialog box can set its text and background colors using the specified display device context handle.
WM_ENTERIDLE	Sent to the owner window of a modal dialog box or menu that is entering an idle state. A modal dialog box or menu enters an idle state when no messages are waiting in its queue after it has processed one or more previous messages.
WM_GETDLGCODE	Sent to the window procedure associated with a control. By default, the system handles all keyboard input to the control; the system interprets certain types of keyboard input as dialog box navigation keys. To override this default behavior, the control can respond to the WM_GETDLGCODE message to indicate the types of input it wants to process itself.
WM_INITDIALOG	Sent to the dialog box procedure immediately before a dialog box is displayed. Dialog box procedures typically use this message to initialize controls and carry out any other initialization tasks that affect the appearance of the dialog box.
WM_NEXTDLGCTL	Sent to a dialog box procedure to set the keyboard focus to a different control in the dialog box.

Dialog Box Structures

Name	Description
DLGITEMTEMPLATE	Defines the dimensions and style of a control in a dialog box. One or more of these structures are combined with a DLGTEMPLATE structure to form a standard template for a dialog box.
DLGITEMTEMPLATEEX	Describes an extended dialog box. For a description of the format of an extended dialog box template, see DLGTEMPLATEEX .
DLGTEMPLATE	Defines the dimensions and style of a dialog box. This structure, always the first in a standard template for a dialog box, also specifies the number of controls in the dialog box and therefore specifies the number of subsequent DLGITEMTEMPLATE structures in the template.
DLGTEMPLATEEX	An extended dialog box template begins with a DLGTEMPLATEEX header that describes the dialog box and

	specifies the number of controls in the dialog box. For each control in a dialog box, an extended dialog box template has a block of data that uses the DLGITEMTEMPLATEEX format to describe the control.
MSGBOXPARAMS	Contains information used to display a message box. The MessageBoxIndirect function uses this structure.

Case study on Menus in windows programming

This section describes menus and explains how to use them.

In This Section

Name	Description
About Menus	Discusses menus.
Using Menus	Provides code examples of tasks related to menus.
Menu Reference	Contains the API reference.

Menu Functions

Name	Description
AppendMenu	Appends a new item to the end of the specified menu bar, drop-down menu, submenu, or shortcut menu. You can use this function to specify the content, appearance, and behavior of the menu item.
CheckMenuItem	Sets the state of the specified menu item's check-mark attribute to either selected or clear.
CheckMenuRadioItem	Checks a specified menu item and makes it a radio item. At the same time, the function clears all other menu items in the associated group and clears the radio-item type flag for those items.
CreateMenu	Creates a menu. The menu is initially empty, but it can be filled with menu items by using the InsertMenuItem , AppendMenu , and InsertMenu functions.
CreatePopupMenu	Creates a drop-down menu, submenu, or shortcut menu. The menu is initially empty. You can insert or append menu items by

	using the InsertMenuItem function. You can also use the InsertMenu function to insert menu items and the AppendMenu function to append menu items.
DeleteMenu	Deletes an item from the specified menu. If the menu item opens a menu or submenu, this function destroys the handle to the menu or submenu and frees the memory used by the menu or submenu.
DestroyMenu	Destroys the specified menu and frees any memory that the menu occupies.
DrawMenuBar	Redraws the menu bar of the specified window. If the menu bar changes after the system has created the window, this function must be called to draw the changed menu bar.
EnableMenuItem	Enables, disables, or grays the specified menu item.
EndMenu	Ends the calling thread's active menu.
GetMenu	Retrieves a handle to the menu assigned to the specified window.
GetMenuBarInfo	Retrieves information about the specified menu bar.
GetMenuCheckMarkDimensions	Retrieves the dimensions of the default check-mark bitmap. The system displays this bitmap next to selected menu items. Before calling the SetMenuItemBitmaps function to replace the default check-mark bitmap for a menu item, an application must determine the correct bitmap size by calling GetMenuCheckMarkDimensions .
GetMenuDefaultItem	Determines the default menu item on the specified menu.
GetMenuInfo	Retrieves information about a specified menu.
GetMenuItemCount	Retrieves the number of items in the specified menu.
GetMenuItemID	Retrieves the menu item identifier of a menu item located at the specified position in a menu.
GetMenuItemInfo	Retrieves information about a menu item.
GetMenuItemRect	Retrieves the bounding rectangle for the specified menu item.
GetMenuState	Retrieves the menu flags associated with the specified menu item. If the menu item opens a submenu, this function also returns the number of items in the submenu.
GetMenuString	Copies the text string of the specified menu item into the specified buffer.
GetSubMenu	Retrieves a handle to the drop-down menu or submenu activated by the specified menu item.
GetSystemMenu	Enables the application to access the window menu (also known as the system menu or the control menu) for copying and modifying.

HiliteMenuItem	Highlights or removes the highlighting from an item in a menu bar.
InsertMenuItem	Inserts a new menu item at the specified position in a menu.
IsMenu	Determines whether a handle is a menu handle.
LoadMenu	Loads the specified menu resource from the executable (.exe) file associated with an application instance.
LoadMenuIndirect	Loads the specified menu template in memory.
MenuItemFromPoint	Determines which menu item, if any, is at the specified location.
ModifyMenu	Changes an existing menu item. This function is used to specify the content, appearance, and behavior of the menu item.
RemoveMenu	Deletes a menu item or detaches a submenu from the specified menu. If the menu item opens a drop-down menu or submenu, RemoveMenu does not destroy the menu or its handle, allowing the menu to be reused. Before this function is called, the GetSubMenu function should retrieve a handle to the drop-down menu or submenu.
SetMenu	Assigns a new menu to the specified window.
SetMenuDefaultItem	Sets the default menu item for the specified menu.
SetMenuInfo	Sets information for a specified menu.
SetMenuItemBitmaps	Associates the specified bitmap with a menu item. Whether the menu item is selected or clear, the system displays the appropriate bitmap next to the menu item.
SetMenuItemInfo	Changes information about a menu item.
TrackPopupMenu	Displays a shortcut menu at the specified location and tracks the selection of items on the menu. The shortcut menu can appear anywhere on the screen.
TrackPopupMenuEx	Displays a shortcut menu at the specified location and tracks the selection of items on the shortcut menu. The shortcut menu can appear anywhere on the screen.

The following function is obsolete.

Name	Description
InsertMenu	<p>Inserts a new menu item into a menu, moving other items down the menu.</p> <p>Note The InsertMenu function has been superseded by the InsertMenuItem function. You can still use InsertMenu, however, if you do not need any of the extended features of InsertMenuItem.</p>

Menu Notifications

Name	Description
WM_COMMAND	Sent when the user selects a command item from a menu, when a control sends a notification message to its parent window, or when an accelerator keystroke is translated.
WM_CONTEXTMENU	Informs a window that the user clicked the right mouse button (<i>right-clicked</i>) in the window.
WM_ENTERMENULOOP	Informs an application's main window procedure that a menu modal loop has been entered.
WM_EXITMENULOOP	Informs an application's main window procedure that a menu modal loop has been exited.
WM_GETTITLEBARINFOEX	Sent to request extended title bar information. A window receives this message through its WindowProc function.
WM_MENUCOMMAND	Sent when the user makes a selection from a menu.
WM_MENUDRAG	Sent to the owner of a drag-and-drop menu when the user drags a menu item.
WM_MENUGETOBJECT	Sent to the owner of a drag-and-drop menu when the mouse cursor enters a menu item or moves from the center of the item to the top or bottom of the item.
WM_MENURBUTTONUP	Sent when the user releases the right mouse button while the cursor is on a menu item.
WM_NEXTMENU	Sent to an application when the right or left arrow key is used to switch between the menu bar and the system menu.
WM_UNINITMENUPOPUP	Sent when a drop-down menu or submenu has been destroyed.

Menu Structures

Name	Description
MDINEXTMENU	Contains information about the menu to be activated.
MENUBARINFO	Contains menu bar information.
MENUEX_TEMPLATE_HEADER	Defines the header for an extended menu template. This structure definition is for explanation only; it is not present in any standard header file.
MENUEX_TEMPLATE_ITEM	Defines a menu item in an extended menu template. This

	structure definition is for explanation only; it is not present in any standard header file.
MENUGETOBJECTINFO	Contains information about the menu that the mouse cursor is on.
MENUINFO	Contains information about a menu.
MENUITEMINFO	Contains information about a menu item.
MENUITEMTEMPLATE	Defines a menu item in a menu template.
MENUITEMTEMPLATEHEADER	Defines the header for a menu template. A complete menu template consists of a header and one or more menu item lists.
TPMPARAMS	Contains extended parameters for the TrackPopupMenuEx function.

Case study of Flip flop

Problem Statement: Push as many signals on the line as is possible , to optimize.

Mapping with real world:

Every computing device is chock full of them. (Flops more so than latches, since they hold their output value while the input is unstable between clock pulses.)

A flip flop acts as a single bit memory, which is needed to store results from sequences of combinational logic in between clock pulses. This allows long chains of logic to be strung together that wouldn't be able to reach a stable output in the time between clocks, due to the switching times of transistors, the length of signal wires, etc.

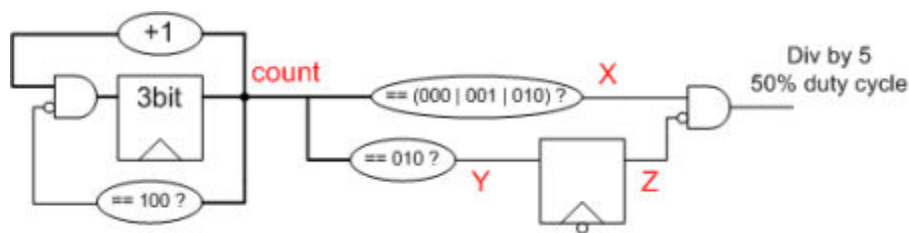
Without the flip flop, the clock frequency of the circuit would be limited to the worst-case (slowest time) of the slowest logic chain of the circuit. With more flops, you can break a chain of logic into more sub-sequences that each need less time than the chain as a whole.

In short, no flip flops, no digital computers. :)

Clock Divider by 5

Here is a neat little circuit that was used in an actual project a long, long time ago (in a galaxy far, far away...).

The requirement was to build a divide by 5 circuit for the clock with 50% duty cycle. The initial (on reset) behavior was not important – i.e. the circuit could wake up in an undefined state, but should have settled after a given time. The engineer produced the circuit below:

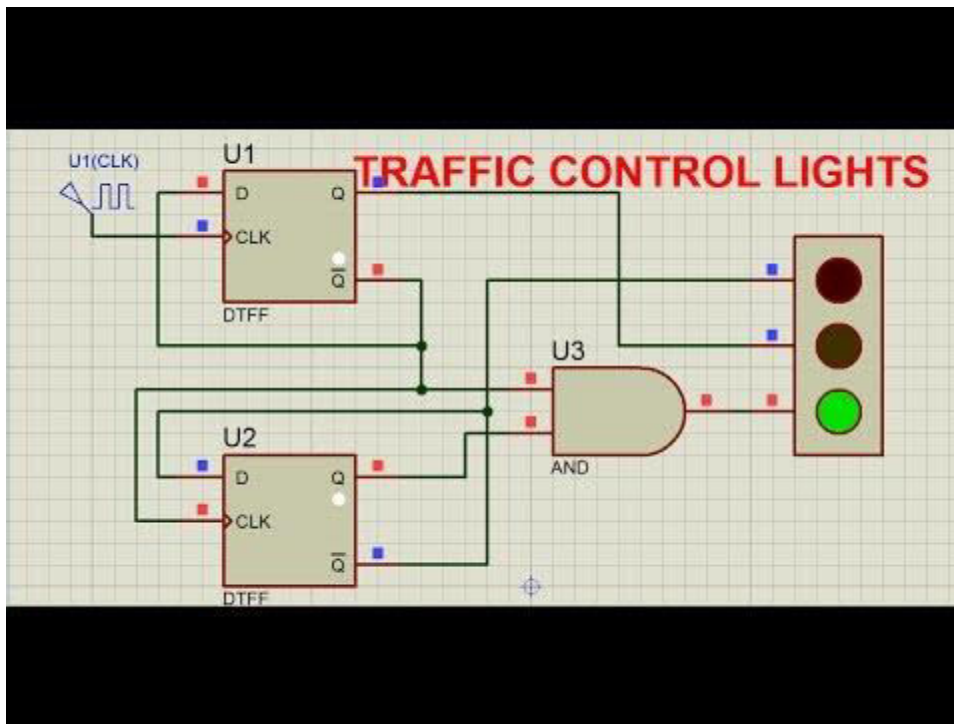


Basically, the circuit is made out of a 3-bit counter, that counts from 000 to 100 and then resets. Signal 'X' goes high when the value of the counter is either 000, 001 or 010. Signal 'Y' goes high when the counter equals its 'middle' state 010. 'Z' is a sample on the *falling* edge of 'Y' in order to generate the 50% duty cycle.

So far so good. The general thinking was OK.

Traffic light simulation using two D-type flip-flops, an AND gate and a clock, provided to one of flip-flops. Timing of the lights can be maintained by changing the clock frequency. Higher the clock frequency, faster will the lights blink and vice-versa. This is one simple application of D-type flip-flops.

it is possible to have different times for the lights. for example have the green light and red light stay on for 2 seconds and the yellow light only stay on for 1 second?.



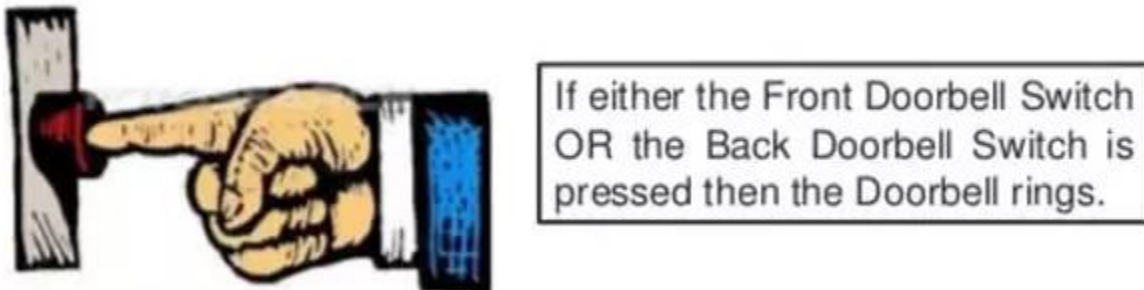
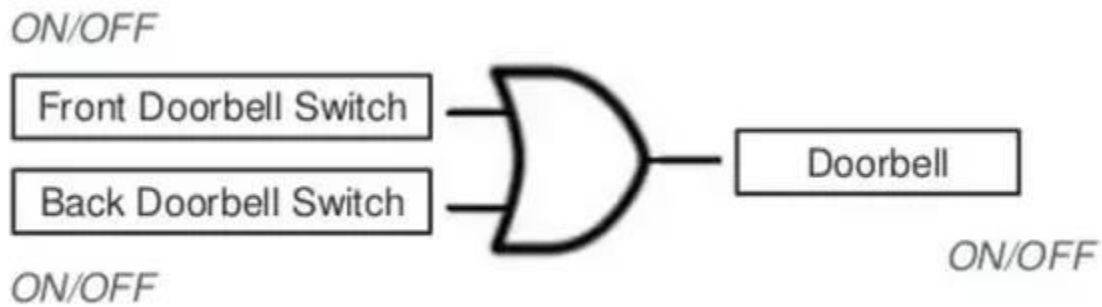
Case study of Logic gates

Problem Statement: The Applications of Logic Gates in our daily life.

Mapping with real world:

one would be a hedge trimmer. For safety they often have two switches. You need to work them with your left AND right hands together. Each, on its own, will do nothing.

Another example would be a basement where one switch in the basement turns on/off the light. Another switch upstairs turns on/off that same light. This is an implication of "OR" logic because you can operate the light via the downstairs switch OR the upstairs switch.



Two buttons to activate the same doorbell.

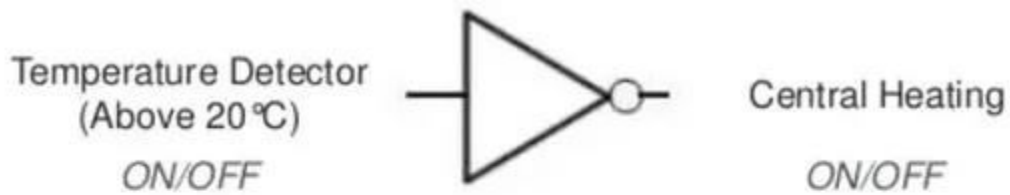
1) Whether you push the button at the front door OR the one at the garage, the doorbell will ring.

2) Eight smoke sensors at the first floor activating one signal (8-inputs OR)

Another eight sensors at the second floor activating another signal (8-inputs OR)

1st OR 2nd floor signals turn a light on in the panel. (2-inputs OR)

That signal AND "bells on" switch on, sound a bell. (2-inputs AND)



If the temperature is above 20°C then the Central Heating is switched off.

If the temperature is below 20°C then the Central Heating is switched on.

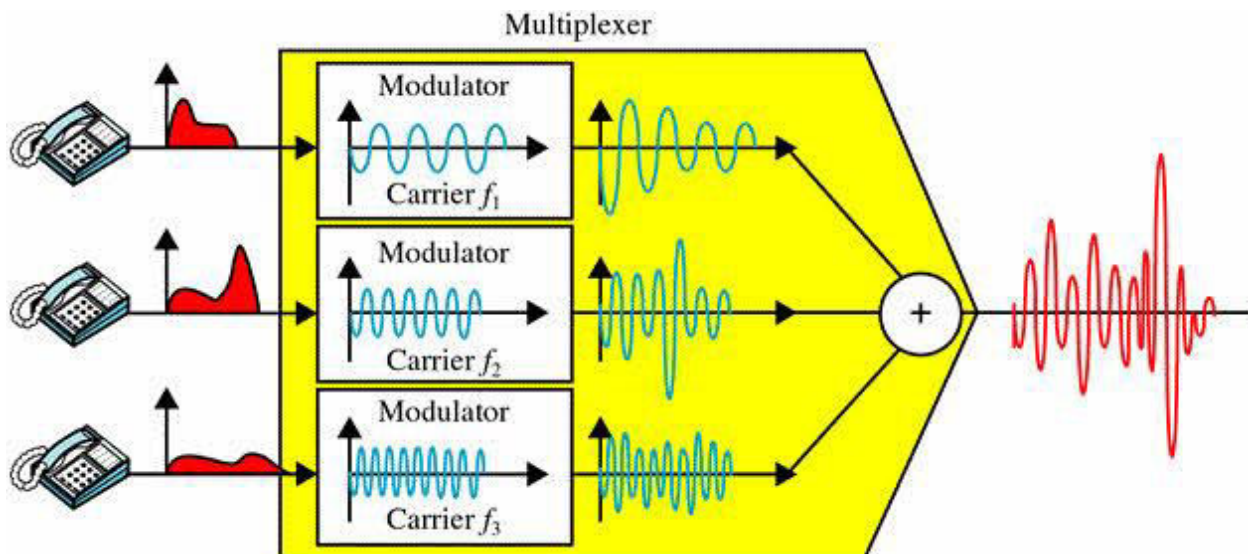
Case study of Multiplexer

Problem Statement: Push as many signals on the line as is possible, to optimize.

Mapping with real world:

Multiplexers are used in building digital semiconductor such as CPUs and graphics controllers. In these applications, the number of inputs is generally a multiple of 2 (2, 4, 8, 16, etc.), the number of outputs is either 1 or relatively small multiple of 2, and the number of control signals is related to the combined number of inputs and outputs. For example, a 2-input, 1-output mux requires only 1 control signal to select the input, while a 16-input, 4-output mux requires 4 control signals to select the input and 2 to select the output.

Multiplexers are also used in communications; the telephone network is an example of a very large virtual mux built from many smaller discrete ones. Instead of having a direct connection from every telephone to every telephone - which would be physically impossible - the network "muxes" individual telephones onto one of a small number of wires as calls are placed. At the receiving end, a demultiplexer, or "demux", chooses the correct destination from the many possible destinations by applying the same principle in reverse.



There are more complex forms of multiplexers. Time-division multiplexers, for example, have the same input/output characteristics as described above, but instead of having a control signal, they alternate between all possible inputs at precise time intervals. By taking turns in this manner, many inputs can share one output. This technique is commonly used on long distance phone lines, allowing many individual phone calls to be spliced together without affecting the speed or quality of any individual call. Time-division multiplexers are generally built as semiconductor devices, or chips, but can also be built as optical devices for fiber optics applications.

Even more complex are code-division multiplexers. Using mathematical techniques developed during *World War II for cryptographic purposes*, they have since found application in modern cellular networks. Generally referred to by the acronym "CDMA" - Code Division Multiple Access - these semiconductor devices work by assigning each input a unique complex mathematical code. Each input applies its code to the signal it receives, and all signals are simultaneously sent to the output. At the receiving end, a demux performs the inverse mathematical operation to extract the original signals.

The source control on a home stereo unit that allows the user to choose between the audio from a compact disc (CD) player, digital versatile disc (DVD) player and cable television line.

Case study of Pipelining

Problem Statement: We can get a better idea of pipelining by considering the famous laundry example.

Mapping with real world:

A microcontroller is a synchronous digital device.i.e. it works based on the timing pulse received from the systems clock circuit. The PIC 16f877a can generate its own clock from a piezo crystal connected to its specific pins.(This is the most popular method of clock generation for its accuracy. Other methods are also available, which will be discussed later).This crystal can be up to a maximum speed of 20Mhz. But, this doesn't mean that the PIC can execute instruction at a maximum speed of 20,000,000 instructions per second (50ns per instruction).

The clocking signal derived from the crystal is internally divided by four. This is to provide synchronization timing and clock signals to all parts of the micro controller. However, the division of master clock is primarily to establish an instruction pipeline. Thus, if we generate a 20Mhz master clock, the execution speed will be a maximum of 5Mhz. The single cycle instructions execute at this speed.

We can get a better idea of pipelining by considering the famous laundry example.

Wash	Dry	Wash	Dry
30 min	30 min	30 min	30 min

Without Pipelining: total time taken - 2 hours

Wash	Dry	
	Wash	Dry
30 min	30 min	30 min

With Pipelining: Total time taken - 1.5 hours

Vysakh P Pillai

Consider a laundry with one washing and one drying machine. If operations are carried out one after another, the entire task (to complete two sets of laundry) takes 2 hours. This is like fetching, decoding and executing instructions only once the previous instruction is completely finished.

But, while the first set is being dried, if the second set is put to wash, the operations are carried out parallel, thereby saving net time. This is the case of instruction execution with pipelining. When one instruction is being executed, the next instruction is fetched and decoded, making it ready for execution. This is illustrated below

Fetch 1	Decode 1	Execute 1		
	Fetch 2	Decode 2	Execute 2	
		Fetch 3	Decode 3	Execute 3

Instruction Pipelining

Case Study on Memory

Problem Statement: *Memory as an area of knowledge is up to perception and interpretation of the knowledge.*

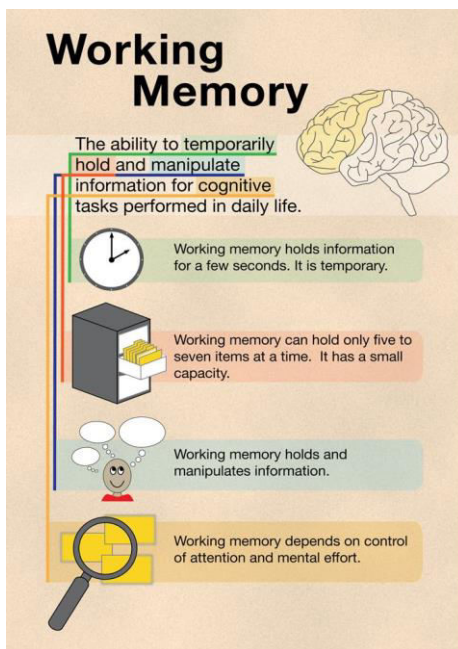
Mapping with real world:

What is working memory?

- Working memory is a psychological construct that refers to the “**processing space**” in the mind/brain when a person computes information.
- Working memory is, for example, where listeners fleetingly **store and process** linguistic data to analyze it for comprehension.
- There are multiple theories and models of working memory, but what they all have in common is the idea that working memory has a **limited capacity**.

This is the working principal of memory of a human being.

Working Memory



The ability to temporarily hold and manipulate information for cognitive tasks performed in daily life.

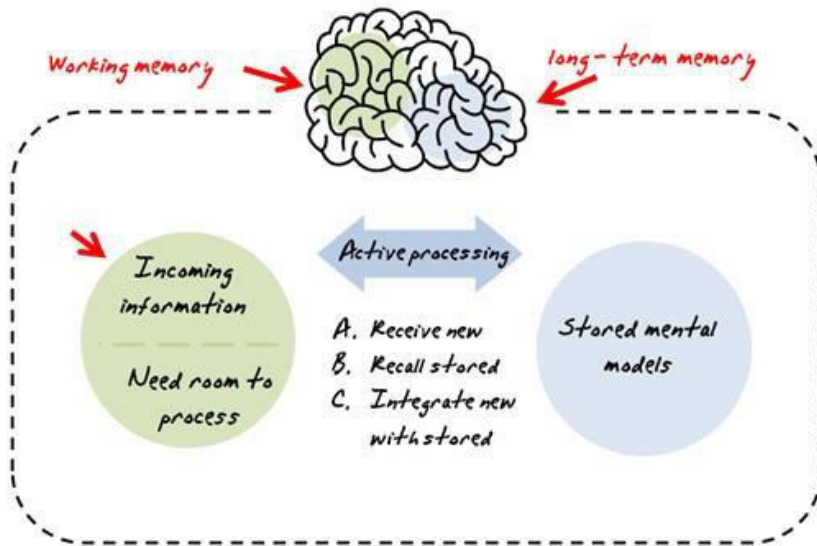
Working memory holds information for a few seconds. It is temporary.

Working memory can hold only five to seven items at a time. It has a small capacity.

Working memory holds and manipulates information.

Working memory depends on control of attention and mental effort.

By a pictorial diagram we can see the mapping between computer memory and brain memory which is obsolete/collapse according to the time.



So we can divide memory long term and short term comparison with volatile and non volatile.

Aging: Prospective Memory

- Laboratory studies
 - no event-based declines (cues given)
 - time-based declines (self-initiated cues)
- Unlike laboratory situations, in real-life prospective memory scenarios the elderly often perform *better* than younger adults.
 - *Example Tasks:*
 - Ask participants to make a telephone call or send a postcard at a specified time.
 - *Rationale:*
 - Older people are more aware of their memory limitations and compensate with various strategies, such as:
 - Diaries
 - Reminders
 - Older people live more ordered and structured lives, making it easier to form plans.
 - Older people may have been more motivated to perform well on a memory task; younger people can explain memory slips by "being too busy".

with getting older there is lots of limitations, one of this is short term memory that is correlated with converting non volatile to volatile memory, and also getting older also decrease the working ability of memory, in computer also

,there is probability of obsolete that generation, and time to walk with the next generation.

Systems Design

What is a System? Give examples.

A set of components working together for a common objective

Information Systems (Web-based)

H/w, S/W, people, Data, Procedures, Web-portals

What is SDLC?

Systems Planning, Systems analysis, systems design, systems development, implementation, maintenance

IS alignment

IS Success

IS usage

User satisfaction

Information waste

IS enabled Competitive advantage

Orgl change

Orgl learning

Easy to use

Perceived personal usefulness

Web-based Information System

Banner – Assess the levels of Flexibility

Stakeholders

What is Systems Design?

Input design

Output Design

Interface design

Database

Technology – Network architecture, Communications Technology

Flexible Systems Design for Web-based IS?

Examples: Banner, Amazon.com, Dell.com – Identify the systems design elements

Flexible Systems Design for Web based Information Systems (Research)

BOM changes affect MRP

In the Banner system, what are the changes that could occur? How do we respond to these changes?

Interviews them

Users – Students, Registrar (Shannon), Dean, etc.

Designers / Planners – Gary

Administration -

Explore the dimensions – Extent, Options, cost, easy, Range, etc. Gain more insight by getting more examples.

- Application architecture Design
- Interface design (User/ System)
- Database
- Network
- Prototype
- Systems controls

Case Study:

- What information systems we are talking about...
- Stake holders for this system
- Involvement of stakeholders in SDLC
- Systems Design activities
- Design decisions
- What are the alternatives for H/W, O/S, Database, PL decisions
- Outputs of each Design phase
- Project Management activities in SDLC/ Systems design
- Set a Time line for this Systems design project
- What are the detailed design tasks

Table 4. Categories of IT changes

Duncan (1995)	Initial items for IT changes
<u>IT infrastructure</u> platform technology network/telecom technologies key enterprise data core enterprise application	Programming languages System analysis/design methodologies System development tools (e.g., CASE) IT architecture Computer hardware platform Operating systems Network environment Telecom environment Other enterprise applications the system was interfaced with Enterprise master data that the system uses Overall IT infrastructure Overall application system development

Table 3. Categories of business changes

Capability Maturity Model	Jalote (2000)	Function Point Analysis	Whitten et al. (2001)
Technical requirements - Performance - Design constraints - Interface requirements - Programming language - End-user functions Non-technical requirements - Products to be delivered - Delivery dates - Milestones * Source: SEI (1994)	Business requirements - Objectives/scope Functional requirements - Business events - Inputs/outputs - Relationship between inputs and outputs - Precedence among events - Screens/reports External interface Operating environment - Hardware/software/network Performance requirements - Response time/throughput Standards requirements - Interface, coding, document Special user requirements - Safety, security, reliability - Backup/recovery, transaction - Training, legal requirements	External inputs External outputs Logical internal files External interface files External inquiries * Source: Low and Jeffery (1990)	Functional requirements - Inputs - Outputs - Processes - Stored data Non-functional requirements - Throughput - Response time, etc.
Initial items for business requirements			
Objectives of the system	Interface with other systems	System safety	
System scope	Data structure	System security	
Delivery date	Data volume	Help functions	
Budget	System response time	Documentation	
Business process supported by the system	System throughput	Legal requirements	
System inputs	System reliability	Overall end-user requirements	
System outputs/reports	Transaction types		
System processes transforming system inputs into outputs	Transaction volume		
	System backup		
	System recovery		

Case Study:

Skills required for Systems Design and Development

People skill (25%) - Listening, understanding others, understanding between two lines, conflict resolution, handling the communications gaps, reporting, walk through, reviews.

Communication Skills (20%) – Oral / Written communication

Documentation skills (30%): Knowledge capturing, diagrams, charts (structure charts, Gantt charts, Business knowledge (business processes, business management knowledge)

Technical skill (25%) - Database design, programming, web design etc.

- What information systems we are talking about...
 1. Design of production scheduling and control system (ERP?)
 2. Web-based production scheduling and control system
 3. Production scheduling and control system

- Stake holders for this system
 1. Users, oversight committee, Production Manager, Chief Analyst
 2. Users, employees, oversight committee, Carla
 3. Users, oversight committee, Project Manager (Carla)

- Involvement of stakeholders in SDLC
 1. Suppliers, Customers, Distributors
 2. Financial involvement of stakeholders
 3. Users & oversight committee – Systems planning & analysis; Project managers – all phases – involvement through out SDLC.

- Systems Design activities
 1. Select DBMS, Programming Languages, Operating systems, user interface, network design, Architectural design, interface design, network design, database design
 2. Hardware & operating systems, web support services, database design, application software design, user interface design
 3. Developing database, choosing system software to support web services, determining what changes will be needed to company network

- Design decisions
 1. DBMS selection, application software selection, web support services selection, Hardware, OS, network changes.

2. Selection of Hardware, OS, DBMS, PL.
 3. MySQL, Windows, Linux, JavaScript, PHP
- What are the alternatives for H/W, O/S, Database, PL decisions
 1. H/W- Servers/ terminals, Hard drive types (speed, size, processor, RAM etc.); OS –Windows, UNIX, Linux; DBMS_ Existing/ new one; PL - COM+, CORBA, SOAP
 2. H/W – generic, IBM, Dell, HP, Sun, Apple; O/S- Windows, Linux, OSX, Sun; Database- Extend existing or new database- Oracle/Access/MySQL; P/L – COM+, CORBA, SOAP C++, JavaScript, PHP, SQL, HTML, XML.
 3. MySQL, Windows, Linux, JavaScript, PHP
 - Outputs of each Design phase
 1. Database schema, Structure chart, screen layout, deployment diagram, application design, DB schema, ERD, Network diagram
 2. Assessment reports, recommendations for each design activity.
 3. Hardware specification documents, ERD, screen layouts
 - Project Management activities in SDLC/ Systems design
 1. Resource allocation, organizing meetings, key players meeting, time lines, personal assignments; plans, timelines, detailed design tasks, personnel assignment, facilitate meetings, review results, performance reviews,
 2. Prepare presentations; get approval from oversight committee, allocating resources.
 3. Setting deadlines, feasibility studies, overseeing
 - Set a Time line for this Systems design project

My comments

Fairchild Pharmaceuticals: Finalizing Architectural Design for a Production

System: This case describes the transition from analysis (detailed knowledge of what the user wants and needs) to design (precise blueprint of a system that will satisfy those wants and needs). Design decisions are constrained by available time, budget, existing systems, skills, and infrastructure.

Focus of the case: Architectural design of infrastructure, development tools, Detailed design.

Major decisions to be made:

Hardware and operating systems, data storage and data access, and development languages and tools.

Options to be made for: Web support services, database design, application software design, and user interface design.

- What information systems we are talking about...
Web-based production scheduling and control system
- Stake holders for this system

Users, oversight committee, Production Manager, Chief Analyst, Production & operational employees, Project Manager, top management, consultants, graphic designers, database designers, user interface designers, system interface designers, application developers, network specialists etc.

- Involvement of stakeholders in SDLC

SDLC phases	Users (Production employees)	Suppliers, Customers, Distributors	Top management	Technical people
Planning	High	Medium	High	Low/Nil
Analysis	High	Medium/High	Medium/Low	Medium/High
Design	Medium	Medium	Low	High
Implementation	Low	Low	Low/Medium	High

- Systems Design activities

Design and integrate the network

- New Network/ Existing Network

Design the application architecture

Specify in details how all system activities will actually be carried out
Done in systems analysis in great detail as logical models, without indicating what specific technology
Models created include physical data flow diagrams, structure charts, interaction diagrams, and other physical models

Design the user interface

Defines how the user will interact with the system
Graphical user interface with windows, dialog boxes, and mouse interaction.
Increasingly, it can include sound, video, and voice commands.

Design the system interface (BOM/ MRP)

One system provides information that is later used by another system
The component that enables systems to share information

Design and integrate the database

Conceptual, logical, and physical model
Relational database consisting of dozens, hundreds, thousands of tables.

Prototype design

Create and evaluate prototypes
Often associated with interface design
Used to confirm design choices about the database, network architecture, controls, or even programming environments

Design and integrate the system controls

Adequate safeguards to protect data/information/ H/w, S/w assets

Limit access to the system to authorized users

System interface controls ensure that other systems cause no harm

Application controls for recording transactions

Database controls - data protection from unauthorized access, accidental loss

Network controls - ensure that communication through networks is protected.

The outputs of Systems Design Process

Application architecture (Process Design)

Functionalities/ Business Processes

DFD, FDD, Event table, use case etc.

Structured Programming

Sequential, Conditional, Iterative – 3 & 4GL.

Network Design

Network design document

Locations of offices, Servers, LAN/WAN

Network capacity (Fig 9-14)

Nodes and location diagrams (Fig 9-8)

Database Design

Conceptual Design

Logical Design

Physical Design

User Interface Design

Input forms design

Output forms design

System Interface Design forms (BOM/ MRP)

Design Prototype

4GL (Access and Frontpage)

Design and Integrate Systems Control

User interface- Allow authorized users

System Interface- No harms by other systems ((BOM/ MRP)

Application architecture – Transaction rules

Database architecture- Protect unauthorized access, back-up, recovery

Network design- Firewalls

• Project Management activities in SDLC/ Systems design

Knowledge Areas	Planning	Analysis	Design	Implementation
Scope management	Objectives Business needs Major functions	Detailed requirements Verify reqts. Solidify scope Plan implementation approach	Control scope Monitor request log Evaluate change request	Control scope Monitor request log Evaluate change request
Time management (in time)	Build WBS Build Schedule Milestones (Gates)	Adjust/optimize schedule Monitor progress	Adjust/optimize schedule Monitor progress	Adjust/optimize schedule Monitor progress
Cost management	Cost / benefits analysis Budget (cash flow)	Monitor ongoing costs Update cost/benefit	Monitor ongoing costs Review budget/cash flow	Monitor ongoing costs Review budget/cash flow
Quality management	Quality metrics System success metrics	Control Quality with procedures and reviews	Control Quality with procedures and reviews	Control and monitor testing Error log
Human Resources Management	Project manager Staffing plan Recruit and staff	Organize teams Team building	Team training Identify/add resources Performance reviews	Provide training Conduct performance reviews.
Communication management	Identify stakeholders Communication plan/mechanisms	Status reviews Status reporting Monitor internal communications	Status reviews Status reporting Monitor internal communications	Status reviews Status reporting Monitor internal communications
Risk management	Feasibility reports. Alternative plans	Reassess risks and monitor PRs, bids,	Reassess risks and monitor Reassess risks	Reassess risks and monitor Reassess risks

Procurement management	Buy options	vendor selection, contracts	and monitor	and monitor
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Outstanding issue control table

Issue Title	Date identified/ target date	Person responsible	User contact	Comments	Status (Done, WIP, Not feasible)
Partial shipments		Jim	Jason	Ship partials or wait for full shipment?	D
Return and commissions		Jim	Bill	Are commissions recouped on returns?	NF
Extra commissions		Mary	Bill	How to handle commissions on special promotions?	WIP

Project Schedule (Gantt Chart)

Activities/ Gates /Milestones Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Planning
Analysis
Design
Coding
Test case development
Data Conversion

Sequential and Parallel activities (Database design & Network design, status meetings, teleconferencing etc.)

Team coordination

- Network design team
- Database design team
- Application architecture design team
- User interface design team
- System interface design team
- Systems controls design team
- Prototype design team

Team interaction among and between the teams (examples?)

Collaborative diagrams for group interactions

Common activities for all teams: Status reviews, walk throughs, network configuration, distributed processing, database design, communication capabilities etc.

Uncommon activities (Team specific) – Response time for a module, I/O for a module, System interface issues etc.

Project team size grows as the system development progresses thru' SDLC.

Case No: 1.1 **STUDY OF UNIX OPERATING SYSTEM**

AIM

To introduce the concept of UNIX Operating System

OPERATING SYSTEM

An Operating System is a set of programs that

Functions as an virtual machine by presenting an interface that is easier to program than the underlying hardware

Acts as resource management through orderly and controlled allocation of the processors, memories, and I/O devices among the programs competing for it.

OS TYPES

1. **Single User**—The system will have its own hard disk, memory, CPU and other resources all dedicated to a single user. Eg. MS-DOS
2. **Multi User**—The users having access to a multi-user system will have just a terminal and a keyboard. The other resources such as hard disk, printers are centrally located. The user is expected to simply hook onto his account, perform the work, disconnect and leave quietly. Eg. UNIX

UNIX HISTORY

The spade work for UNIX began at AT&T Bell Laboratories in 1969 by Ken Thompson and Dennis Ritchie. The OS was initially known as UNICS (jokingly UNiplexed Information and Computing System). In 1970 UNICS finally became UNIX. In 1973, UNIX was rewritten in 1973 in C principally authored by Ritchie.

UNIX FEATURES

1. **Multi-user system**—Multi-user capability of UNIX allows several users to use the same computer to perform their tasks. Several terminals [Keyboards and Monitors] are connected to a single powerful computer [UNIX server] and each user can work with their terminals.
2. **Multi-tasking system**—Multitasking is the capability of the operating system to perform various task simultaneously, i.e. a user can run multiple tasks concurrently.
3. **Programming Facility**—UNIX is highly programmable, the UNIX shell has all the necessary ingredients like conditional and control structures, etc.
4. **Security**—UNIX allows sharing of data; every user must have a single login name and password. So, accessing another user's data is impossible without his permission.
5. **Portability**—UNIX is portable because it is written in a high level language. So, UNIX can be run on different computers.

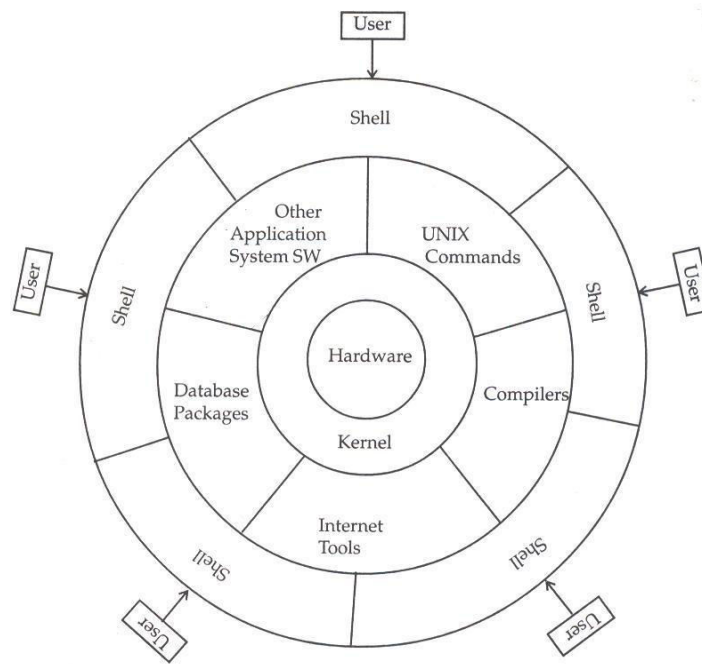
6. **Communication**—UNIX supports communication between different terminals of the same server as well as between terminals on different servers.

Apart from these features, UNIX has an extensive Tool kit, exhaustive system calls and Libraries and enhanced GUI (X Window).

ORGANIZATION OF UNIX

The UNIX system is functionally organized at three levels and are:

1. The **kernel**, which schedules tasks and manages storage;
2. The **shell**, which connects and interprets users' commands, calls programs from memory, and executes them; and
3. The **tools and applications** that offer additional functionality to the OS



UNIX Structure

The kernel is the heart of the system, a collection of programs written in C that directly communicate with the hardware. There is only one kernel for any system. It's that part of UNIX system that is loaded into memory when the system is booted. It manages the system resources, allocates time between user and processes, decides process priorities, and performs all other tasks. The kernel, in traditional parlance, is often called the Operating system.

The shell, on the other hand, is the "sleeping beauty" of UNIX. It is actually the interface between the user and the kernel. The shell is the agency which takes care of the features of redirection and has a programming capability of its own.

The Tools and Applications consist of Application Software, Compilers, Database Package, Internet tools, UNIX commands, etc.

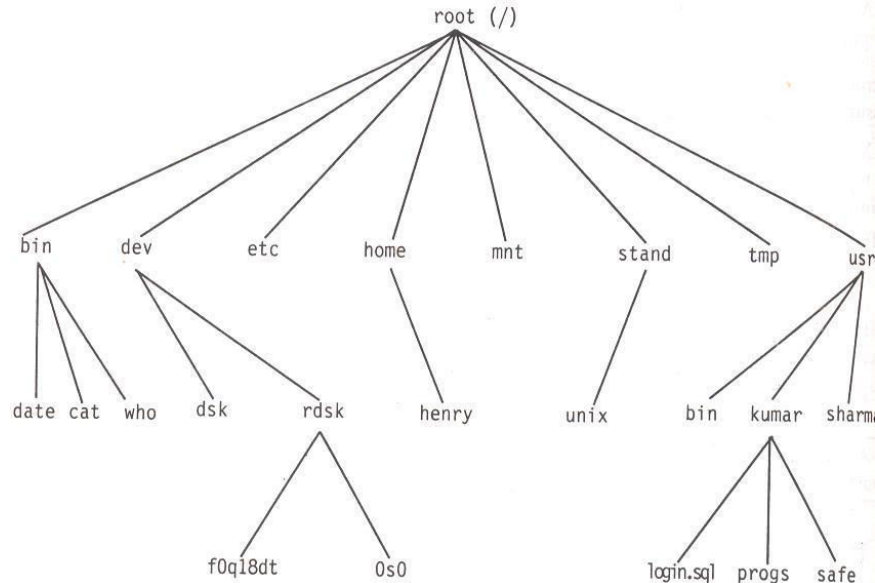
FILE SYSTEM

A file in UNIX is nothing but a storehouse of information and everything is treated as a file by UNIX. The files can be broadly classified as follows:

Ordinary files—Contains stream of data. All data, text, source programs, object and executable code, commands fall into this category.

Directory files—Contains no external data. It contains an entry, name of the file and its inode (identification number) for each file and subdirectory under that directory. Directory files are not created by the user but by the UNIX system itself.

Device files—Even physical devices are treated as files. These are special in the sense that any output directed to it will be reflected onto the respective device.



UNIX File System

All files in UNIX are related to one another. The file system of UNIX resembles a tree that grows from top to bottom as shown in the figure. The file system begins with a directory called root (at the top). The root directory is denoted by a slash (\). Branching from root there are several directories such as **bin**, **lib**, **etc**, **tmp**, **dev**. Each of these directories contains several sub-directories and files.

Result

Thus the study of UNIX Operating System has been completed successfully.

Aim

To study and execute Unix commands.

Unix is security conscious, and can be used only by those persons who have an account. *Telnet* (Telephone Network) is a Terminal emulator program for TCP/IP networks that enables users to log on to remote servers.

To *login*, type **telnet server_ipaddress** in **run** window.

User has to authenticate himself by providing *username* and *password*. Once verified, a greeting and **\$** prompt appears. The shell is now ready to receive commands from the user. Options suffixed with a hyphen (-) and arguments are separated by space.

General commands

Command	Function
date	Used to display the current system date and time.
date +%D	Displays date only
date +%T	Displays time only
date +% Y	Displays the year part of date
date +% H	Displays the hour part of time
Cal	Calendar of the current month
cal year	Displays calendar for all months of the specified year
cal month year	Displays calendar for the specified month of the year
Who	Login details of all users such as their IP, Terminal No, User name,
who am i	Used to display the login details of the user
Tty	Used to display the terminal name
uname	Displays the Operating System
uname -r	Shows version number of the OS (kernel).
uname -n	Displays domain name of the server
echo "txt"	Displays the given text on the screen
echo \$HOME	Displays the user's home directory
Bc	Basic calculator. Press Ctrl+d to quit
lp file	Allows the user to spool a job along with others in a print queue.
man cmdname	Manual for the given command. Press q to exit
history	To display the commands used by the user since log on.
exit	Exit from a process. If shell is the only process then logs out

Directory commands

Command	Function
Pwd	Path of the present working directory
mkdir dir	A directory is created in the given name under the current directory
mkdir dir1 dir2	A number of sub-directories can be created under one stroke
cd subdir	Change Directory. If the <i>subdir</i> starts with / then path starts from root (absolute) otherwise from current working directory.
Cd	To switch to the home directory.
cd /	To switch to the root directory.

Command	Function
<code>cd ..</code>	To move back to the parent directory
<code>rmdir subdir</code>	Removes an empty sub-directory.

File commands

Command	Function
<code>cat > filename</code>	To create a file with some contents. To end typing press Ctrl+d . The <code>></code> symbol means redirecting output to a file. (<code><</code> for input)
<code>cat filename</code>	Displays the file contents.
<code>cat >> filename</code>	Used to append contents to a file
<code>cp src des</code>	Copy files to given location. If already exists, it will be overwritten
<code>cp -i src des</code>	Warns the user prior to overwriting the destination file
<code>cp -r src des</code>	Copies the entire directory, all its sub-directories and files.
<code>mv old new</code>	To rename an existing file or directory. <code>-i</code> option can also be used
<code>mv f1 f2 f3 dir</code>	To move a group of files to a directory.
<code>mv -v old new</code>	Display name of each file as it is moved.
<code>rm file</code>	Used to delete a file or group of files. <code>-i</code> option can also be used
<code>rm *</code>	To delete all the files in the directory.
<code>rm -r *</code>	Deletes all files and sub-directories
<code>rm -f *</code>	To forcibly remove even write-protected files
<code>ls</code>	Lists all files and subdirectories (blue colored) in sorted manner.
<code>ls name</code>	To check whether a file or directory exists.
<code>ls name*</code>	Short-hand notation to list out filenames of a specific pattern.
<code>ls -a</code>	Lists all files including hidden files (files beginning with <code>.</code>)
<code>ls -x dirname</code>	To have specific listing of a directory.
<code>ls -R</code>	Recursive listing of all files in the subdirectories
<code>ls -l</code>	Long listing showing file access rights (read/write/execute- rw x for user/group/others- ugo).
<code>cmp file1 file2</code>	Used to compare two files. Displays nothing if files are identical.
<code>wc file</code>	It produces a statistics of lines (l), words(w), and characters(c).
<code>chmod perm file</code>	Changes permission for the specified file. (<code>r=4, w=2, x=1</code>) <code>chmod 740 file</code> sets all rights for user, read only for groups and no rights for others

The commands can be combined using the pipeline (`|`) operator. For example, number of users logged in can be obtained as.

```
who | wc -l
```

Finally to terminate the unix session execute the command **exit** or **logout**.

Result

Thus the study and execution of Unix commands has been completed successfully.

```
[vijai@localhost vijai]$ date
Sat Apr  9 13:03:47 IST 2011
[vijai@localhost vijai]$ date +%D
04/09/11
[vijai@localhost vijai]$ date +%T
13:05:33
[vijai@localhost vijai]$ date +%Y
2011
[vijai@localhost vijai]$ date +%H
13
```

```
[vijai@localhost vijai]$ cal
```

```
    April 2011
Su Mo Tu We Th Fr
Sa 1  2 3  4  5  6
      7  8  9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
```

```
[vijai@localhost vijai]$ cal 08 1998
```

```
    August 1998
Su Mo Tu We Th Fr
Sa 1  2  3  4  5  6
      7  8
  9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31
```

```
[vijai@localhost vijai]$ cal 1800
```

```

                                1800

    January                    February                    March
Su Mo Tu We Th Fr Sa   Su Mo Tu We Th Fr Sa   Su Mo Tu We Th Fr Sa
      1  2  3  4                1
  5  6  7  8  9 10 11    2  3  4  5  6  7  8    2  3  4  5  6  7  8
12 13 14 15 16 17 18    9 10 11 12 13 14 15    9 10 11 12 13 14 15
19 20 21 22 23 24 25   16 17 18 19 20 21 22   16 17 18 19 20 21 22
26 27 28 29 30 31      23 24 25 26 27 28      23 24 25 26 27 28 29
                                30 31

    ...

    October                    November                    December
Su Mo Tu We Th Fr Sa   Su Mo Tu We Th Fr Sa   Su Mo Tu We Th Fr Sa
      1  2  3  4                1                1  2  3  4  5  6
```

```
5 6 7 8 9 10 11 2 3 4 5 6 7 8 7 8 9 10 11 12 13
12 13 14 15 16 17 18 9 10 11 12 13 14 15 14 15 16 17 18 19 20
19 20 21 22 23 24 25 16 17 18 19 20 21 22 21 22 23 24 25 26 27
26 27 28 29 30 31 23 24 25 26 27 28 29 28 29 30 31
```

30

```
[vijai@localhost vijai]$ who
root      :0          Apr  9 08:41
vijai     pts/0        Apr  9 13:00 (scl-64)
csel      pts/3        Apr  9 13:18 (scl-41.smkfomra.com)
ece       pts/4        Apr  9 13:18 (scl-29.smkfomra.com)
```

```
[vijai@localhost vijai]$ who am i
vijai     pts/0        Apr  9 13:00 (scl-64)
```

```
[vijai@localhost vijai]$ tty
/dev/pts/0
```

```
[vijai@localhost vijai]$ uname
Linux
```

```
[vijai@localhost vijai]$ uname -r
2.4.20-8smp
```

```
[vijai@localhost vijai]$ uname -n
localhost.localdomain
```

```
[vijai@localhost vijai]$ echo "How are you"
How are you
```

```
[vijai@localhost vijai]$ echo $HOME
/home/vijai
```

```
[vijai@localhost vijai]$ echo $USER
vijai
```

```
[vijai@localhost vijai]$
```

```
bc bc 1.06
```

```
Copyright 1991-1994, 1997, 1998, 2000 Free Software Foundation,
Inc. 3+5 8 2%3 2
```

```
[vijai@localhost loops]$ pwd
/home/vijai/shellscripts/loops
```

```
[vijai@localhost vijai]$ mkdir filter
[vijai@localhost vijai]$ ls
filter list.sh regexpr shellscripts
```

```
[vijai@localhost vijai]$ cd
```

```
shellscripts/loops/ [vijai@localhost loops]$
```

```
[vijai@localhost loops]$ cd
[vijai@localhost vijai]$
[vijai@localhost loops]$ cd
/ [vijai@localhost /]$
[vijai@localhost /]$ cd /home/vijai/shellscripts/loops/
[vijai@localhost loops]$ cd ..
[vijai@localhost shellscripts]$
[vijai@localhost vijai]$ rmdir
filter [vijai@localhost vijai]$ ls
list.sh  regexpr  shellscripts
[vijai@localhost vijai]$ cat >
greet hi ece-a
wishing u the best
[vijai@localhost vijai]$ cat
greet hi ece-a
wishing u the best
[vijai@localhost vijai]$ cat >>
greet bye
[vijai@localhost vijai]$ cat
greet hi ece-a
wishing u the
best bye
[vijai@localhost vijai]$ ls
greet  list.sh  regexpr  shellscripts

[vijai@localhost vijai]$ ls -a
.          .bash_logout  .canna  .gtkrc  regexpr  .viminfo.tmp
..         .bash_profile .emacs  .kde    shellscripts  .xemacs
.bash_history  .bashrc      greet   list.sh  .viminfo
[vijai@localhost vijai]$ ls -l
total 16
-rw-rw-r--  1 vijai  vijai           32 Apr 11 14:52 greet
-rw-rw-r--  1 vijai  vijai           30 Apr  4 13:58 list.sh
drwxrwxr-x  2 vijai  vijai          4096 Apr  9 14:30 regexpr
drwxrwxr-x  7 vijai  vijai          4096 Apr  4 14:57 shellscripts
[vijai@localhost vijai]$ cp greet ./regexpr/

[vijai@localhost vijai]$ ls
```

```
greet list.sh regexpr shellscripts
[vijai@localhost vijai]$ ls
./regexpr demo greet
[vijai@localhost vijai]$ cp -i greet
./regexpr/ cp: overwrite 'greet'? n
[vijai@localhost vijai]$ mv greet
greet.txt [vijai@localhost vijai]$ ls
greet.txt list.sh regexpr shellscripts
[vijai@localhost vijai]$ mv greet.txt ./regexpr/
[vijai@localhost vijai]$ ls
list.sh regexpr shellscripts
[vijai@localhost vijai]$ ls
./regexpr/ demo greet.txt
[vijai@localhost vijai]$ ls

fact.sh list.sh prime.sh regexpr shellscripts
[vijai@localhost vijai]$ rm -i *.sh
rm: remove regular file `fact.sh'? y
rm: remove regular file `list.sh'? n
rm: remove regular file `prime.sh'? y
[vijai@localhost vijai]$ ls
list.sh regexpr shellscripts
[vijai@localhost vijai]$ wc list.sh
      4      9     30 list.sh
[vijai@localhost vijai]$ wc -l list.sh
      4 list.sh
[vijai@localhost vijai]$ cmp list.sh
fact.sh list.sh fact.sh differ: byte 1, line 1

[vijai@localhost vijai]$ ls -l list.sh
-rw-rw-r--  1 vijai  vijai           30 Apr  4 13:58 list.sh
[vijai@localhost vijai]$ chmod ug+x list.sh
[vijai@localhost vijai]$ ls -l list.sh
-rwxrwxr--  1 vijai  vijai           30 Apr  4 13:58 list.sh
[vijai@localhost vijai]$ chmod 740 list.sh
[vijai@localhost vijai]$ ls -l list.sh
-rwxr-----  1 vijai  vijai           30 Apr  4 13:58 list.sh
```

Aim

To introduce the concept of text editing **vi** editor and the options regarding the control of the editor.

vi Editor

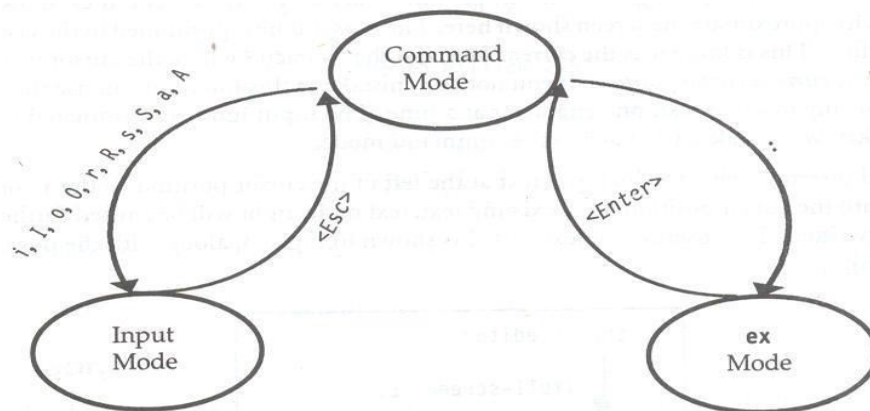
A *text editor* is one of the most common and useful tools in all Operating Systems. Unix provides a versatile editor **vi**, a full-screen editor and owes its origin to Bill Joy. "vi" stands for *visual* editor. A vi session begins by invoking vi with or without a filename

`$vi`

`$vi filename`

The user is presented with a full empty screen, each line beginning with a ~. This is **vi**'s way of indicating non-existent lines. Out of 25 lines on the terminal, 24 can be used to enter text. The last line is reserved for commands and also used by the system to display messages. **vi** functions in three modes namely:

1. **Input mode**—Where any key depressed is entered as text
2. **Command mode**—Where keys are used as commands to act on text (initial mode)
3. **ex mode**—ex mode commands that can be entered in the last line to act on text

**vi modes****INPUT MODE**

vi starts with command mode. To insert text any of the following commands should be used.

Commands	Function
i	Inserts text to the left of the cursor.
I	Inserts text at the beginning of line.
a	Appends text to right of cursor
A	Appends text at end of line
o	Opens line below
O	Opens line above

In *Input* mode the editor displays **INSERT** in the last line. Press *Enter* key to start a fresh line of text in *Input* mode and the ~ disappears. To quit *input* mode press *Esc* key.

COMMAND MODE

EDIT COMMANDS

Command	Function
R	Replaces more than a single character. The editor displays REPLACE in the last line. The existing text is overwritten as they are typed.
s	Deletes a single character to the left and switches to Input mode.
x	Deletes the character in the current cursor position
? <i>text</i>	Locates the <i>text</i> in the file. If not found, the message "Pattern not found" appears. Use n to repeat the forward search and N for backward search.
U or u	Reverses the last change made to the buffer.
dd	Cuts the entire line
dw	Cuts the entire word
d\$	Cuts a line from cursor position to the end of the line
d0	Cuts from the cursor position to the start of the line
yy	Copies (yanks) the entire line
yw	Copies the entire word
p	Pastes the text

NAVIGATION COMMANDS

Command	Function
b	Moves back to beginning of a word
w	Moves forward to beginning of word
	Moves to start of the line
\$	Moves to end of the line
k	Up one line
j	Down one line
h	Left one character
l	Right one character
Ctrl+f	Scrolls a page forward
Ctrl+b	Scrolls a page backward
/G	To move to the specific line

One of the most notable features of **vi** is the facility of prefixing a number to most commands. When prefixed, commands interpret the instruction to be repeated as many times. For example **3x** deletes the next three character.

THE EX MODE

The essential save and exit commands form the features of **ex** mode. Press **:** (colon) in command mode to switch to **ex** mode. The **:** is displayed in the last line. Type the command and press *Enter* key to execute the same.

Command	Function
w	Saves file, displays the number of lines & characters and returns to Input mode. If it is an unnamed file then vi puts a message.
w <i>file</i>	The file is saved under the given name
L1,L2 w <i>file</i>	Used to write specific line numbers to some file. The . (dot) represents current line, 0 for first line and \$ could be used to represent last line.
q	Quits vi session and returns to \$ prompt. vi has a safety mechanism that warns if changes made to file are not saved.
q!	Quits vi session without saving any changes made since the last save
wq	Save and exit
sh	Escape to shell
%s/ <i>Sstr/Rstr/g</i>	This is yet another powerful feature known as substitution. It is similar to Find and Replace. % represents all lines, g makes it global. To make vi ask for confirmation before replacing use gc instead of g .
r <i>file</i>	To insert another file into the current file.
new <i>file</i>	Splits screen into multiple windows and opens the file.

```

~
~
~
~
~
~
~
~
~
~
~
"Sample.txt" [New File]

```

vi Editor for new file

```

This is vi improved –
vim A rudimentary text
~
~
~
~
~
~
~
~
~
~
~
vi editor
~
"Sample.txt" 2L, 30C written

```

vi Editor with Contents

Result

Thus the study of text manipulation using vi editor has been completed successfully.

Case No: 1.4

Simple Filters

Aim

To query a data file using filter commands in unix.

Filters are the central commands of the UNIX tool kit. It acts on data file where lines are *records*, *fields* delimited by a character not used by the data (mostly |, default is white space). The output is a set of records and the input file is unaltered by these commands.

20057801 Aarthi	ECE	CTS	36000
20057702 Albert Jerry	CSE	Wipro	25000
20057903 Arun	IT	Ramco	12000
20057904 Diwakar	IT	TCS	10500
20057705 Geetha	CSE	Infosys	23000
20057806 Irudayaraj	ECE	Polaris	30000
20057707 Jaya Prakash	CSE	Ramco	28000
20058008 Mahesh	EEE	Microsoft	5000
20057909 Manimaran	IT	Microsoft	9000
20058010 Mohammed Mukthar	EEE	Oracle	6000
20057711 Prithivi Rajan	CSE	Ramco	25000
20057712 Pushpak Chander	CSE	CTS	27500
20057713 Ramesh	CSE	Wipro	24000
20057817 Smitha	ECE	Ramco	30000

stud file

Command	Function
head	used to display the first few records (10 records by default)
head stud	Displays first 10 records by default
head -5 stud	Displays first 5 records
head -l stud wc -c	length of first record
tail	used to display the last few records (10 records by default)
tail stud	Displays last 10 records by default
tail -5 stud tee last5	Last 5 records listed & stored in file <i>last5</i> using <i>tee</i>
cut	used to extract specific fields. The d option specifies the delimiter and f for specifying the field list. The c option may be used if extraction is done character wise
cut -d \ -f 1,3,4 stud	Fields 1,3,4 listed
cut -d \ -f 2-4 stud	Fields 2,3,4 listed
paste -d \ list1 list2	merges two cut files <i>list1</i> and <i>list2</i>
sort	reorders the file as per ASCII sequence. The t option is used to specify delimiter
sort stud	Sorted on 1 st column by default
sort -t \ +2 stud	Sort as per 3 rd column
sort -c stud	Check if file is sorted using c option
sort -t \ +3 -4 +4 stud	Sorting on secondary keys
sort -t \ -nr +4 stud	Sort on numeric field using n option, r for reverse
uniq stud	Display unique entries in a sorted file
nl	display file content with lines numbered. The s option is used to specify separator
nl -s " " stud	Displays entries numbered with separator
tr	translates characters. Can be used to change text case. It works with standard input <
tr '[a-z]' '[A-Z]' < stud	Changes text to upper case

Result

Thus information retrieval using filters has been completed successfully.

```
[vijai@localhost filters]$ head stud
20057801|Aarthi          |ECE |CTS          |36000
20057702|Albert Jerry      |CSE |Wipro          |25000
20057903|Arun                |IT  |Ramco          |12000
20057904|Diwakar             |IT  |TCS            |10500
20057705|Geetha              |CSE |Infosys        |23000
20057806|Irudayaraj         |ECE |Polaris        |30000
20057707|Jaya Prakash        |CSE |Ramco          |28000
20058008|Mahesh              |EEE |Microsoft      |5000
20057909|Manimaran           |IT  |Microsoft      |9000
20058010|Mohammed Mukthar   |EEE |Oracle         |6000
```

```
[vijai@localhost filters]$ head -4 stud
20057801|Aarthi          |ECE |CTS          |36000
20057702|Albert Jerry      |CSE |Wipro          |25000
20057903|Arun                |IT  |Ramco          |12000
20057904|Diwakar             |IT  |TCS            |10500
```

```
[vijai@localhost filters]$ head -1 stud | wc -c
```

49

```
[vijai@localhost filters]$ tail stud
20058008|Mahesh          |EEE |Microsoft      |5000
20057909|Manimaran           |IT  |Microsoft      |9000
20058010|Mohammed Mukthar   |EEE |Oracle         |6000
20057711|Prithivi Rajan     |CSE |Ramco          |25000
20057712|Pushpak Chander    |CSE |CTS            |27500
20057713|Ramesh             |CSE |Wipro          |24000
20057817|Smitha              |ECE |Ramco          |30000
20057718|Sri Gurumoorthy    |IT  |Microsoft      |11000
20057719|Tamil Selvi        |EEE |CTS            |3500
20057720|Thamocharan        |IT  |CTS            |9000
```

```
[vijai@localhost filters]$ tail -2 stud | tee last2
```

```
20057719|Tamil Selvi        |EEE |CTS            |3500
20057720|Thamocharan        |IT  |CTS            |9000
```

```
[vijai@localhost filters]$ cat last2
```

```
20057719|Tamil Selvi        |EEE |CTS            |3500
20057720|Thamocharan        |IT  |CTS            |9000
```

```
[vijai@localhost filters]$ cut -d \| -f 2,4-5 stud
```

```
20057801|Aarthi          |ECE
20057702|Albert Jerry      |CSE
20057903|Arun                |IT
20057904|Diwakar             |IT
20057705|Geetha              |CSE
20057806|Irudayaraj         |ECE
20057707|Jaya Prakash        |CSE
20058008|Mahesh              |EEE
```

```
20057909|Manimaran      |IT
20058010|Mohammed Mukthar |EEE
20057711|Prithivi Rajan   |CSE
20057712|Pushpak Chander  |CSE
20057713|Ramesh           |CSE
20057817|Smitha           |ECE
20057718|Sri Gurumoorthy  |IT
20057719|Tamil Selvi      |EEE
20057720|Thamotharan      |IT
```

```
[vijai@localhost filters]$ cut -d \| -f 2,4 stud >
nameorg [vijai@localhost filters]$ cut -d \| -f 5 stud
> sal [vijai@localhost filters]$ paste -d \| nameorg sal
```

```
Aarthi           |CTS           |36000
Albert Jerry     |Wipro         |25000
Arun             |Ramco         |12000
Diwakar         |TCS           |10500
Geetha          |Infosys       |23000
Irudayaraj      |Polaris       |30000
Jaya Prakash    |Ramco         |28000
Mahesh          |Microsoft     |5000
Manimaran       |Microsoft     |9000
Mohammed Mukthar|Oracle        |6000
Prithivi Rajan  |Ramco         |25000
Pushpak Chander |CTS           |27500
Ramesh          |Wipro         |24000
Smitha          |Ramco         |30000
Sri Gurumoorthy |Microsoft     |11000
Tamil Selvi     |CTS           |3500
Thamotharan     |CTS           |9000
```

```
[vijai@localhost filters]$ sort stud
```

```
20057702|Albert Jerry     |CSE |Wipro         |25000
20057705|Geetha          |CSE |Infosys       |23000
20057707|Jaya Prakash    |CSE |Ramco         |28000
20057711|Prithivi Rajan  |CSE |Ramco         |25000
20057712|Pushpak Chander |CSE |CTS           |27500
20057713|Ramesh          |CSE |Wipro         |24000
20057718|Sri Gurumoorthy |IT  |Microsoft     |11000
20057719|Tamil Selvi     |EEE |CTS           |3500
20057720|Thamotharan     |IT  |CTS           |9000
20057801|Aarthi          |ECE |CTS           |36000
20057806|Irudayaraj     |ECE |Polaris       |30000
20057817|Smitha          |ECE |Ramco         |30000
20057903|Arun            |IT  |Ramco         |12000
20057904|Diwakar         |IT  |TCS           |10500
20057909|Manimaran       |IT  |Microsoft     |9000
20058008|Mahesh          |EEE |Microsoft     |5000
20058010|Mohammed Mukthar|EEE |Oracle        |6000
```

```
[vijai@localhost filters]$ sort -t \| +1 stud
```

20057801 Aarthi	ECE	CTS	36000
20057702 Albert Jerry	CSE	Wipro	25000
20057903 Arun	IT	Ramco	12000
20057904 Diwakar	IT	TCS	10500
20057705 Geetha	CSE	Infosys	23000
20057806 Irudayaraj	ECE	Polaris	30000
20057707 Jaya Prakash	CSE	Ramco	28000
20058008 Mahesh	EEE	Microsoft	5000
20057909 Manimaran	IT	Microsoft	9000
20058010 Mohammed Mukthar	EEE	Oracle	6000
20057711 Prithivi Rajan	CSE	Ramco	25000
20057712 Pushpak Chander	CSE	CTS	27500
20057713 Ramesh	CSE	Wipro	24000
20057817 Smitha	ECE	Ramco	30000
20057718 Sri Gurumoorthy	IT	Microsoft	11000
20057719 Tamil Selvi	EEE	CTS	3500
20057720 Thamotharan	IT	CTS	9000

```
[vijai@localhost filters]$ sort -t \| +3 -4 +2 stud
```

20057712 Pushpak Chander	CSE	CTS	27500
20057801 Aarthi	ECE	CTS	36000
20057719 Tamil Selvi	EEE	CTS	3500
20057720 Thamotharan	IT	CTS	9000
20057705 Geetha	CSE	Infosys	23000
20058008 Mahesh	EEE	Microsoft	5000
20057718 Sri Gurumoorthy	IT	Microsoft	11000
20057909 Manimaran	IT	Microsoft	9000
20058010 Mohammed Mukthar	EEE	Oracle	6000
20057806 Irudayaraj	ECE	Polaris	30000
20057711 Prithivi Rajan	CSE	Ramco	25000
20057707 Jaya Prakash	CSE	Ramco	28000
20057817 Smitha	ECE	Ramco	30000
20057903 Arun	IT	Ramco	12000
20057904 Diwakar	IT	TCS	10500
20057713 Ramesh	CSE	Wipro	24000
20057702 Albert Jerry	CSE	Wipro	25000

```
[vijai@localhost filters]$ sort -t \| -nr +4 stud
```

20057801 Aarthi	ECE	CTS	36000
20057817 Smitha	ECE	Ramco	30000
20057806 Irudayaraj	ECE	Polaris	30000
20057707 Jaya Prakash	CSE	Ramco	28000
20057712 Pushpak Chander	CSE	CTS	27500
20057711 Prithivi Rajan	CSE	Ramco	25000
20057702 Albert Jerry	CSE	Wipro	25000
20057713 Ramesh	CSE	Wipro	24000
20057705 Geetha	CSE	Infosys	23000

20057903 Arun	IT	Ramco	12000
20057718 Sri Gurumoorthy	IT	Microsoft	11000
20057904 Diwakar	IT	TCS	10500
20057909 Manimaran	IT	Microsoft	9000
20057720 Thamotharan	IT	CTS	9000
20058010 Mohammed Mukthar	EEE	Oracle	6000
20058008 Mahesh	EEE	Microsoft	5000
20057719 Tamil Selvi	EEE	CTS	3500

[vijai@localhost filters]\$ **tr '[a-z]' '[A-Z]' < stud**

20057801 AARTHI	ECE	CTS	36000
20057702 ALBERT JERRY	CSE	WIPRO	25000
20057903 ARUN	IT	RAMCO	12000
20057904 DIWAKAR	IT	TCS	10500
20057705 GEETHA	CSE	INFOSYS	23000
20057806 IRUDAYARAJ	ECE	POLARIS	30000
20057707 JAYA PRAKASH	CSE	RAMCO	28000
20058008 MAHESH	EEE	MICROSOFT	5000
20057909 MANIMARAN	IT	MICROSOFT	9000
20058010 MOHAMMED MUKTHAR	EEE	ORACLE	6000
20057711 PRITHIVI RAJAN	CSE	RAMCO	25000
20057712 PUSHPAK CHANDER	CSE	CTS	27500
20057713 RAMESH	CSE	WIPRO	24000
20057817 SMITHA	ECE	RAMCO	30000
20057718 SRI GURUMOORTHY	IT	MICROSOFT	11000
20057719 TAMIL SELVI	EEE	CTS	3500
20057720 THAMOTHARAN	IT	CTS	9000

[vijai@localhost filters]\$ **nl -s "|" stud**

1 20057801 Aarthi	ECE	CTS	36000
2 20057702 Albert Jerry	CSE	Wipro	25000
3 20057903 Arun	IT	Ramco	12000
4 20057904 Diwakar	IT	TCS	10500
5 20057705 Geetha	CSE	Infosys	23000
6 20057806 Irudayaraj	ECE	Polaris	30000
7 20057707 Jaya Prakash	CSE	Ramco	28000
8 20058008 Mahesh	EEE	Microsoft	5000
9 20057909 Manimaran	IT	Microsoft	9000
10 20058010 Mohammed Mukthar	EEE	Oracle	6000
11 20057711 Prithivi Rajan	CSE	Ramco	25000
12 20057712 Pushpak Chander	CSE	CTS	27500
13 20057713 Ramesh	CSE	Wipro	24000
14 20057817 Smitha	ECE	Ramco	30000
15 20057718 Sri Gurumoorthy	IT	Microsoft	11000
16 20057719 Tamil Selvi	EEE	CTS	3500
17 20057720 Thamotharan	IT	CTS	9000

Case No: 1.5

Regular Expression

Aim

To search for regular expression in a file using grep command in unix.

A frequent requirement is to look for a pattern or expression in a file. Unix handles this feature through **grep** and **egrep**. **grep** uses an regular expression to display lines that match and **egrep** enables searching for multiple patterns. Its usage is

`grep options searchtext filename`

```
THIS LINE IS THE 1ST UPPER CASE LINE IN THIS FILE.
this line is the 1st lower case line in this file.
This Line Has All Its First Character Of The Word With Upper Case.
Two lines above this line is
empty. vim Word Navigation
You may want to do several navigation in relation to words, such as:
1. e - go to the end of the current word.
2. E - go to the end of the current WORD.
3. b - go to the previous word.
4. B - go to the previous WORD.
WORD - WORD consists of a sequence of non-blank characters
Word - word consists of a sequence of letters, digits and
underscores. telnet 172.16.4.256
```

demo file

Command	Function
<code>grep this demo</code>	Lists the lines that contains the string <i>this</i>
<code>grep 'end of' demo</code>	Quotes mandatory for text containing space
<code>grep this demo*</code>	Search <i>this</i> in multiple files
<code>grep -c to demo</code>	Number of occurrence of the word <i>to</i> in the file
<code>grep -n sequence demo</code>	Display line numbers along with matching lines
<code>grep -v word demo</code>	Displays lines that does not contain the text <i>word</i>
<code>grep -l vim *</code>	Displays files containing text <i>vim</i>
<code>grep -i WORD demo</code>	Search for text ignoring case differences
<code>grep '^ [0-9]' demo</code>	Lines that start with a number
<code>grep '[0-9]\$' demo</code>	Lines that end with a number
<code>ls -l grep "^d"</code>	Display the subdirectory names
<code>grep -c "^\$" demo</code>	Display count of blank lines in the file.
<code>grep "2....\$" stud</code>	Display lines that ends in the range 20000–29999
<code>egrep "lower UPPER" demo</code>	Display lines that match either <i>lower</i> or <i>upper</i>
<code>egrep "(previous current) word" demo</code>	Display lines that match either <i>previous word</i> or <i>current word</i>

Result

Thus searching text patterns in files using grep has been completed successfully.

```
[vijai@localhost regexpr]$ grep this demo
```

```
this line is the 1st lower case line in this  
file. Two lines above this line is empty.
```

```
[vijai@localhost regexpr]$ grep 'end of' demo
```

1. e - go to the end of the current word.
2. E - go to the end of the current WORD.

```
[vijai@localhost regexpr]$ grep -c to demo
```

```
5
```

```
[vijai@localhost regexpr]$ grep -n sequence demo
```

```
15:WORD - WORD consists of a sequence of non-blank characters  
16:Word - word consists of a sequence of letters, digits and underscores.
```

```
[vijai@localhost regexpr]$ grep -v word demo
```

```
THIS LINE IS THE 1ST UPPER CASE LINE IN THIS FILE.  
this line is the 1st lower case line in this file.  
This Line Has All Its First Character Of The Word With Upper Case.
```

```
Two lines above this line is
```

```
empty. vim Word Navigation
```

2. E - go to the end of the current

```
WORD. 4. B - go to the previous WORD.
```

```
WORD - WORD consists of a sequence of non-blank characters
```

```
telnet 172.16.4.256
```

```
[vijai@localhost regexpr]$ grep -l vim
```

```
* demo readme
```

```
[vijai@localhost regexpr]$ grep -i WORD demo
```

```
This Line Has All Its First Character Of The Word With Upper  
Case. vim Word Navigation
```

```
You may want to do several navigation in relation to words, such as:
```

1. e - go to the end of the current word.
2. E - go to the end of the current WORD.
3. b - go to the previous word.
4. B - go to the previous WORD.

```
WORD - WORD consists of a sequence of non-blank characters
```

```
Word - word consists of a sequence of letters, digits and underscores.
```

```
[vijai@localhost regexpr]$ grep '^[0-9]' demo
```

1. e - go to the end of the current word.
2. E - go to the end of the current WORD.
3. b - go to the previous word.
4. B - go to the previous WORD.

```
[vijai@localhost regexpr]$ grep '[0-9]$'
demo telnet 172.16.4.256
[vijai@localhost vijai]$ ls -l | grep "^d"
drwxrwxr-x    2 vijai    vijai            4096 Apr  9 14:30 regexpr
drwxrwxr-x    7 vijai    vijai            4096 Apr  4 14:57 shellscripts
[vijai@localhost regexpr]$ grep -c "^$" demo
5
[vijai@localhost regexpr]$ egrep "lower|UPPER" demo
THIS LINE IS THE 1ST UPPER CASE LINE IN THIS FILE.
this line is the 1st lower case line in this file.
[vijai@localhost regexpr]$ egrep "(previous|current) word" demo
1. e - go to the end of the current
word. 3. b - go to the previous word.
```


Database Management System

Case Studies

Case Study 1

Hospital Management System

Aim: XYZ hospital is a multi specialty hospital that includes a number of departments, rooms, doctors, nurses, compounders, and other staff working in the hospital. Patients having different kinds of ailments come to the hospital and get checkup done from the concerned doctors. If required they are admitted in the hospital and discharged after treatment.

The aim of this case study is to design and develop a database for the hospital to maintain the records of various departments, rooms, and doctors in the hospital. It also maintains records of the regular patients, patients admitted in the hospital, the check up of patients done by the doctors, the patients that have been operated, and patients discharged from the hospital.

Description: In hospital, there are many departments like Orthopedic, Pathology, Emergency, Dental, Gynecology, Anesthetics, I.C.U., Blood Bank, Operation Theater, Laboratory, M.R.I., Neurology, Cardiology, Cancer Department, Corpse, etc. There is an OPD where patients come and get a card (that is, entry card of the patient) for check up from the concerned doctor. After making entry in the card, they go to the concerned doctor's room and the doctor checks up their ailments. According to the ailments, the doctor either prescribes medicine or admits the patient in the concerned department. The patient may choose either private or general room according to his/her need. But before getting admission in the hospital, the patient has to fulfill certain formalities of the hospital like room charges, etc. After the treatment is completed, the doctor discharges the patient. Before discharging from the hospital, the patient again has to complete certain formalities of the hospital like balance charges, test charges, operation charges (if any), blood charges, doctors' charges, etc.

Next we talk about the doctors of the hospital. There are two types of the doctors in the hospital, namely, *regular doctors* and *call on doctors*. Regular doctors are those doctors who come to the hospital daily. Calls on doctors are those doctors who are called by the hospital if the concerned doctor is not available.

Table Description:

Following are the tables along with constraints used in *Hospital Management* database.

1. **DEPARTMENT:** This table consists of details about the various departments in the hospital. The information stored in this table includes department name, department location, and facilities available in that department.

Constraint: Department name will be unique for each department.

2. **ALL_DOCTORS:** This table stores information about all the doctors working for the hospital and the departments they are associated with. Each doctor is given an identity number starting with DR or DC prefixes only.

Constraint: Identity number is unique for each doctor and the corresponding department should exist in **DEPARTMENT** table.

3. **DOC_REG:** This table stores details of regular doctors working in the hospital. Doctors are referred to by their doctor number. This table also stores personal details of doctors like name, qualification, address, phone number, salary, date of joining, etc.

Constraint: Doctor's number entered should contain DR only as a prefix and must exist in **ALL_DOCTORS** table.

4. **DOC_ON_CALL:** This table stores details of doctors called by hospital when additional doctors are required. Doctors are referred to by their doctor number. Other personal details like name, qualification, fees per call, payment due, address, phone number, etc., are also stored.

Constraint: Doctor's number entered should contain DC only as a prefix and must exist in **ALL_DOCTORS** table.

5. **PAT_ENTRY:** The record in this table is created when any patient arrives in the hospital for a check up. When patient arrives, a patient number is generated which acts as a primary key. Other details like name, age, sex, address, city, phone number, entry date, name of the doctor referred to, diagnosis, and department name are also stored. After storing the necessary details patient is sent to the doctor for check up.

Constraint: Patient number should begin with prefix PT. Sex should be *M* or *F* only. Doctor's name and department referred must exist.

6. **PAT_CHKUP:** This table stores the details about the patients who get treatment from the doctor referred to. Details like patient number from patient entry table, doctor number, date of check up, diagnosis, and treatment are stored. One more field status is used to indicate whether patient is admitted, referred for operation or is a regular patient to the hospital. If patient is admitted, further details are stored in **PAT_ADMIT**

table. If patient is referred for operation, the further details are stored in **PAT_OPR** table and if patient is a regular patient to the hospital, the further details are stored in **PAT_REG** table.

Constraint: Patient number should exist in **PAT_ENTRY** table and it should be unique.

7. **PAT_ADMIT:** When patient is admitted, his/her related details are stored in this table. Information stored includes patient number, advance payment, mode of payment, room number, department, date of admission, initial condition, diagnosis, treatment, number of the doctor under whom treatment is done, attendant name, etc.

Constraint: Patient number should exist in **PAT_ENTRY** table. Department, doctor number, room number must be valid.

8. **PAT_DIS:** An entry is made in this table whenever a patient gets discharged from the hospital. Each entry includes details like patient number, treatment given, treatment advice, payment made, mode of payment, date of discharge, etc.

Constraint: Patient number should exist in **PAT_ENTRY** table.

9. **PAT_REG:** Details of regular patients are stored in this table. Information stored includes date of visit, diagnosis, treatment, medicine recommended, status of treatment, etc.

Constraint: Patient number should exist in patient entry table. There can be multiple entries of one patient as patient might be visiting hospital repeatedly for check up and there will be entry for patient's each visit.

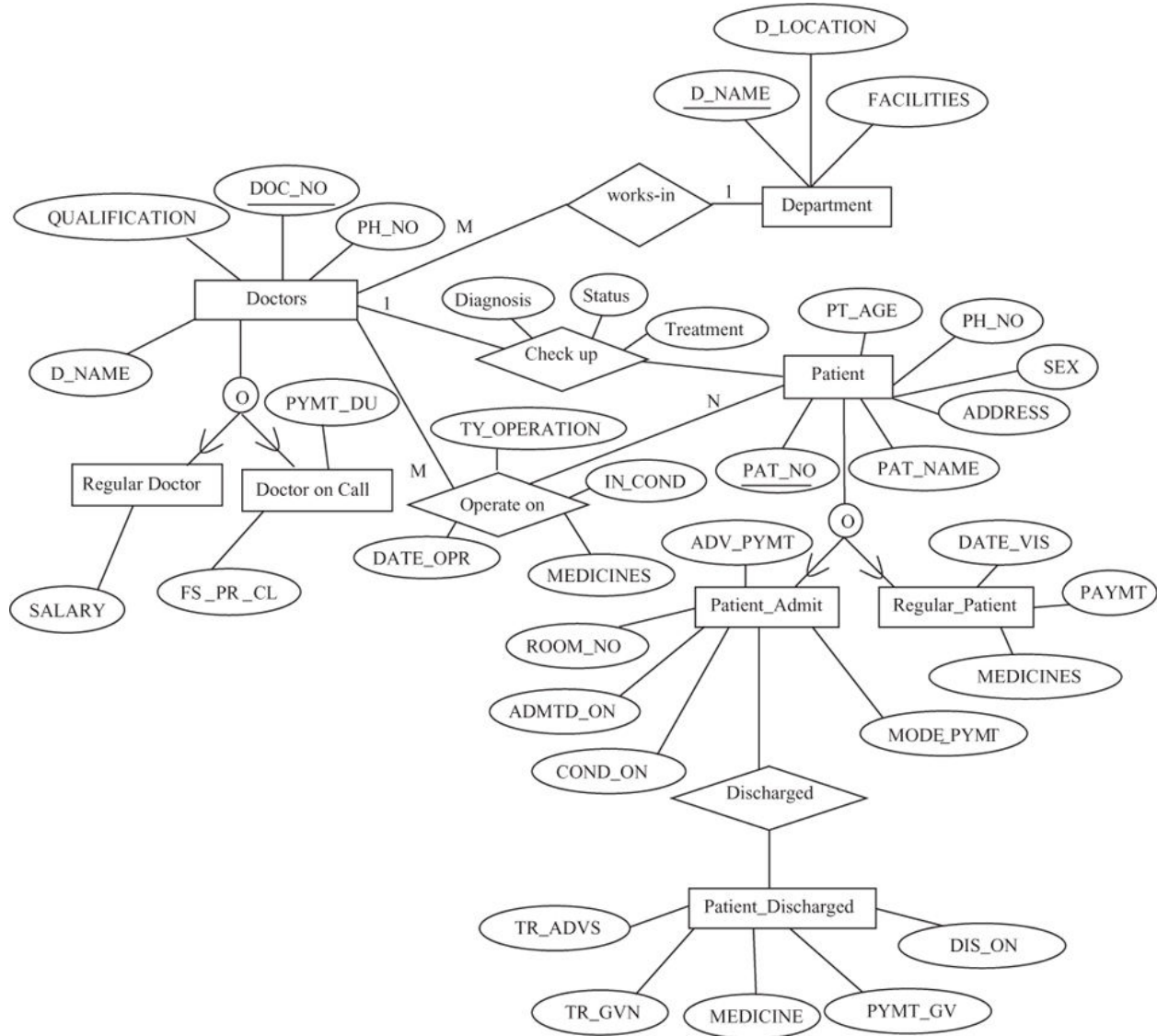
10. **PAT_OPR:** If patient is operated in the hospital, his/her details are stored in this table. Information stored includes patient number, date of admission, date of operation, number of the doctor who conducted the operation, number of the operation theater in which operation was carried out, type of operation, patient's condition before and after operation, treatment advice, etc.

Constraint: Patient number should exist in **PAT_ENTRY** table. Department, doctor number should exist or should be valid.

11. **ROOM_DETAILS:** It contains details of all rooms in the hospital. The details stored in this table include room number, room type (general or private), status (whether occupied or not), if occupied, then patient number, patient name, charges per day, etc.

Constraint: Room number should be unique. Room type can only be *G* or *P* and status can only be *Y* or *N*

E-R Diagram



Relational Database Schema for Case Study

The relational database schema for *Hospital Management* database is as follows:

1. DEPARTMENT (D_NAME, D_LOCATION, FACILITIES)
2. ALL_DOCTORS (DOC_NO, DEPARTMENT)
3. DOC_REG(DOC_NO, D_NAME, QUALIFICATION, SALARY, EN_TIME, EX_TIME, ADDRESS, PH_NO, DOJ)

4. DOC_ON_CALL (DOC_NO, D_NAME, QUALIFICATION, FS_PR_CL, PYMT_DU, ADDRESS, PH_NO)
5. PAT_ENTRY (PAT_NO, PAT_NAME, CHKUP_DT, PT_AGE, SEX, RFRG_CSTNT, DIAGNOSIS, RFD, ADDRESS, CITY, PH_NO, DEPARTMENT)
6. PAT_CHKUP (PAT_NO, DOC_NO, DIAGNOSIS, STATUS, TREATMENT)
7. PAT_ADMIT (PAT_NO, ADV_PYMT, MODE_PYMT, ROOM_NO, DEPTNAME, ADMTD_ON, COND_ON, INVSTGTN_DN, TRMT_SDT, ATTDNT_NM)
8. PAT_DIS (PAT_NO, TR_ADVS, TR_GVN, MEDICINES, PYMT_GV, DIS_ON)
9. PAT_REG (PAT_NO, DATE_VIS, CONDITION, TREATMENT, MEDICINES, DOC_NO, PAYMT)
10. PAT_OPR (PAT_NO, DATE_OPR, IN_COND, AFOP_COND, TY_OPERATION, MEDICINES, DOC_NO, OPTH_NO, OTHER_SUG)
11. ROOM_DETAILS (ROOM_NO, TYPE, STATUS, RM_DL_CRG, OTHER_CRG)

Case Study 2

Railway Reservation

Aim: The railway reservation system facilitates the passengers to enquire about the trains available on the basis of source and destination, booking and cancellation of tickets, enquire about the status of the booked ticket, etc.

The aim of case study is to design and develop a database maintaining the records of different trains, train status, and passengers. The record of train includes its number, name, source, destination, and days on which it is available, whereas record of train status includes dates for which tickets can be booked, total number of seats available, and number of seats already booked. The database has been developed and tested on the Oracle.

Description:

Passengers can book their tickets for the train in which seats are available. For this, passenger has to provide the desired train number and the date for which ticket is to be booked. Before booking a ticket for a passenger, the validity of train number and booking date is checked. Once the train number and booking date are validated, it is checked whether the seat is available. If yes, the ticket is booked with confirm status and corresponding ticket ID is generated which is stored along with other details of the passenger. After all the available tickets are booked, certain numbers of tickets are booked with waiting status. If waiting lot is also finished, then tickets are not booked and a message of non-availability of seats is displayed.

The ticket once booked can be cancelled at any time. For this, the passenger has to provide the ticket ID (the unique key). The ticket ID is searched and the corresponding record is deleted. With this, the first ticket with waiting status also gets confirmed.

List of Assumption

Since the reservation system is very large in reality, it is not feasible to develop the case study to that extent and prepare documentation at that level. Therefore, a small sample case study has been created to demonstrate the working of the reservation system. To implement this sample case study, some assumptions have been made, which are as follows:

1. The number of trains has been restricted to 5.
2. The booking is open only for next seven days from the current date.
3. Only two categories of tickets can be booked, namely, *AC* and *General*.
4. The total number of tickets that can be booked in each category (*AC* and *General*) is 10.
5. The total number of tickets that can be given the status of waiting is 2.

6. The in-between stoppage stations and their bookings are not considered.

Description of Tables and Procedures

Tables and procedures that will be created are as follows:

1. **TrainList:** This table consists of details about all the available trains. The information stored in this table includes train number, train name, source, destination, fair for AC ticket, fair for general ticket, and weekdays on which train is available.

Constraint: The train number is unique.

2. **Train_Status:** This table consists of details about the dates on which ticket can be booked for a train and the status of the availability of tickets. The information stored in this table includes train number, train date, total number of AC seats, total number of general seats, number of AC seats booked, and number of general seats booked.

Constraint: Train number should exist in **TrainList** table.

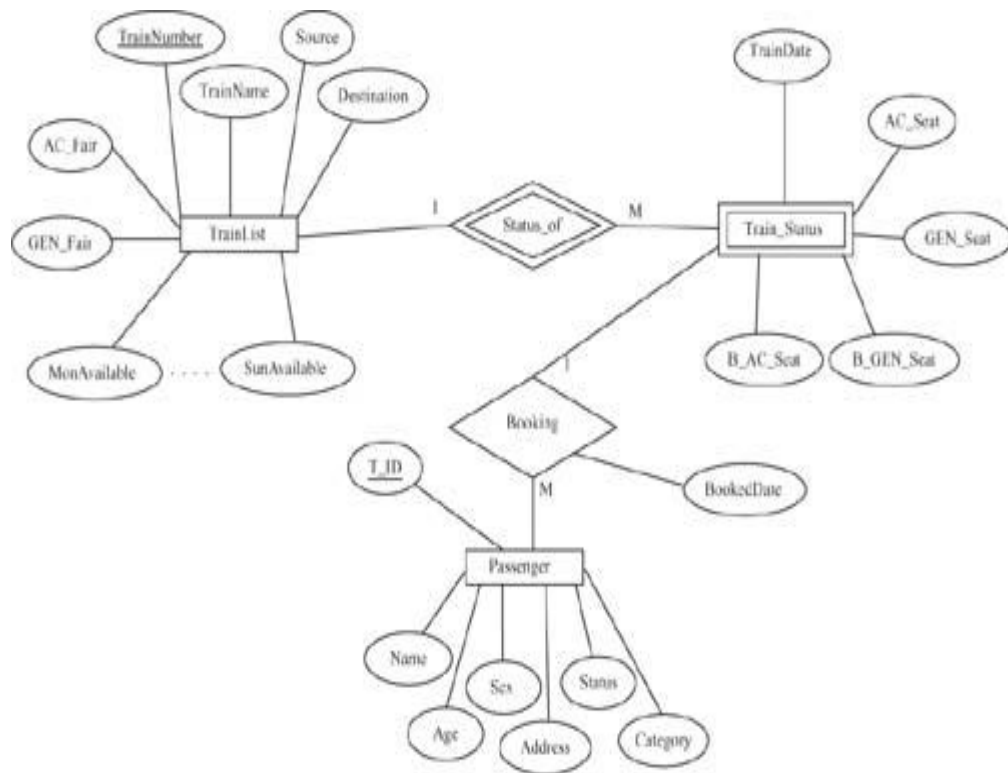
3. **Passenger:** This table consists of details about the booked tickets. The information stored in this table includes ticket ID, train number, date for which ticket is booked, name, age, sex and address of the passenger, status of reservation (either confirmed or waiting), and category for which ticket is booked.

Constraint: Ticket ID is unique and the train number should exist in **TrainList** table.

4. **Booking:** In this procedure, the train number, train date, and category is read from the passenger. On the basis of the values provided by the passenger, corresponding record is retrieved from the **Train_Status** table. If the desired category is AC, then total number of AC seats and number of booked AC seats are compared in order to find whether ticket can be booked or not. Similarly, it can be checked for the general category. If ticket can be booked, then passenger details are read and stored in the **Passenger** table.

5. **Cancel:** In this procedure, ticket ID is read from the passenger and corresponding record is searched in the **Passenger** table. If the record exists, it is deleted from the table. After deleting the record (if it is confirmed), first record with waiting status for the same train and same category are searched from the **Passenger** table and its status is changed to confirm.

E-R diagram



Case Study 3

Painting Hire Business

System Description:

A local businesswoman has decided to start her own Internet business, called Masterpieces Ltd, hiring paintings to private individuals and commercial companies.

Because of your reputation as a database designer she has called upon your services to design and implement a database to support her new business. At the initial planning meeting, to discuss the design, the following user requirements were requested.

The system must be able to manage the details of customers, paintings and those paintings currently on hire to customers. Customers are categorized as B (bronze), S (silver), G (gold) or P (platinum). These categories entitle a customer to a discount of 0%, 5%, 10% or 15% respectively.

Customers often request paintings by a particular artist or theme (eg animal, landscape, seascape, naval, still-life, etc). Over time a customer may hire the same painting more than once.

Each painting is allocated a customer monthly rental price defined by the owner. The owner of the painting is then paid 10% of that customer rental price. Any paintings that are not hired within six months are returned to the owner. However, after three months, an owner may resubmit a returned painting.

Each painting can only have one artist associated with it.

Several reports are required from the system. Three main ones are:

1. For each customer, a report showing an overview of all the paintings they have hired or are currently hiring
2. For each artist, a report of all paintings submitted for hire
3. For each artist, a returns report for those paintings not hired over the past six months

Remember to **identify key attributes** and any **foreign key attributes**.

Return to Owner Report

Return <u>To</u> Owner Report		
Owner No: _____	Owner Name: _____	
	Owner Address: _____	

Painting No	Painting Title	Return Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Case Study 4

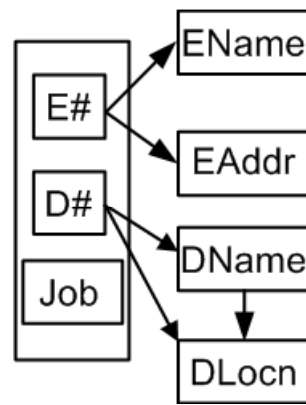
The WORK relation illustrates data about employees, their job title and the department they are assigned to. From examining sample data and discussions with management we have found that employees can have multiple job titles and can be assigned to more than one department. Each department is completely sited in a single location but a city could have more than one department at some time.

WORK JOB	ENAME	EADDR	E#	D#	DNAME	DLOCN
HELPER	DAVIS	111 FIRST ST	12	1	PRESSING	ALCOA
HELPER	SPENCE	222 SECOND ST	78	1	PRESSING	ALCOA
ELECTRICIAN	MURPHY	100 MAIN ST	66	2	WELDING	NIOTA
FOREMAN	SMITH	300 BROAD ST	77	9	PACKING	LOUDON
CLERK	WILSON	111 FIRST ST	99	7	PAYROLL	MEMPHIS
CLERK	DAVIS	111 FIRST ST	12	1	PRESSING	ALCOA
CLERK	SPENCE	222 SECOND ST	78	1	PRESSING	ALCOA
CLERK	DAVIS	111 FIRST ST	12	5	MAILROO M	ONEIDA

For this relation, a composed key is required as no one attribute is a candidate. It turns out that the following SRN depicts the situation:

WORK (Job, EName, EAddr, E#, D#, DName, DLocn)

and the functional dependency diagrams would be:



There are numerous problems with the data model as it currently stands. We cannot add new employees until they have a job title and a department assignment. We can easily lose

department data by removing an employee who is the sole person assigned to a department. Certain updates require careful propagation of changes throughout the database. Careful decomposition can take care of these problems. The employee data makes an obvious grouping and should be decomposed to get it into at least 2NF. It will actually go to BCNF as there are no further problems. It is ready to become a table.

EMPLOYEE E#	ENAME	EADDR
12	DAVIS	111 FIRST ST
78	SPENCE	222 SECOND ST
66	MURPHY	100 MAIN ST
77	SMITH	300 BROAD ST
99	WILSON	111 FIRST ST

The Dept relation is another logical decomposition to remove the partial dependency and move to 2NF. Careful examination reveals the transitive dependency still exists so further decomposition is necessary.

DEPT D#	DNAME	DLOCN
1	PRESSING	ALCOA
2	WELDING	NIOTA
9	PACKING	LOUDON
7	PAYROLL	MEMPHIS
5	MAILROOM	ONEIDA

Job-Worked winds up looking like the original relation's key. All three attributes are still the composed key. Since there are no dependencies, there is nothing to prevent this relation from being BSNF so it is ready too.

JOB-WORKED E#	D#	JOB
12	1	HELPER
78	1	HELPER
66	2	ELECTRICIAN
77	9	FOREMAN
99	7	CLERK
12	1	CLERK
78	1	CLERK
12	5	CLERK

To remove the transitive dependency, we will decompose Dept into Department and Dept-Locn.

Each of these is now in BCNF.

DEPARTMENT D#	DNAME
1	PRESSING
2	WELDING
9	PACKING
7	PAYROLL
5	MAILROOM

DEPT-LOCN D#	DLOCN
1	ALCOA
2	NIOTA
9	LOUDON
7	MEMPHIS
5	ONEIDA

Case Study 5

A relational database is to be designed for a medium sized Company dealing with industrial applications of computers. The Company delivers various products to its customers ranging from a single application program through to complete installation of hardware with customized software. The Company employs various experts, consultants and supporting staff. All personnel are employed on long-term basis, i.e. there is no short-term or temporary staff. Although the Company is somehow structured for administrative purposes (that is, it is divided into departments headed by department managers) all projects are carried out in an inter-disciplinary way. For each project a project team is selected, grouping employees from different departments, and a Project Manager (also an employee of the Company) is appointed who is entirely and exclusively responsible for the control of the project, quite independently of the Company's hierarchy. The following is a brief statement of some facts and policies adopted by the Company.

- Each employee works in some department.
- An employee may possess a number of skills
- Every manager (including the MD) is an employee
- A department may participate in none/one/many projects.
- At least one department participates in a project.
- An employee may be engaged in none/one/many projects
- Project teams consist of at least one member.

For the above business stories you are expected to create the following.

1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model (ER diagrams).

Case Study on Abstraction

Problem Statement: "*Abstraction* involves the facility to define objects that represent abstract "actors" that can perform work, report on and change their state, and "communicate" with other objects in the system."

Mapping with real world:

Let's imagine you own a Ferrari Car and you are the only one knows how to drive it in your family. One day a terrible breakdown happened to your car and you bring one mechanic to home and he checked it. But he is unable to repair it. So you contacted Ferrari company and some chief mechanic came to your home and repaired it(Since your car is under warranty, your pocket is still big :-))This is a real time example for the above mentioned OOP's concepts,

Before mentioning anything about abstraction, we can take three different users here (I am calling them as entity)

1) You 2) Local Mechanic 3) Expert

You Entity: Since you know only to start the car by pressing a button and all other operations behind the scene are abstracted from you.

Local Mechanic Entity: Our local mechanic knows some of the implementation of starting the car, i.e. he can open car's bonnet and check the battery cable or chock etc. So in short Local Mechanic Entity knows some of the implementations of the car.

Expert Entity: Since our expert (Designer of the car) mechanic knows all the operations of our car, he can repair it very quickly. So in short Expert Entity knows all the implementations of the car.

The car's operation is completely abstracted from you and it is partially implemented to Local Mechanic Entity and fully implemented to Expert Entity. So you are an abstract class having only abstract methods, Local Mechanic Entity has extended You(Since he is

also an ordinary user) and he implemented some of the methods and last our expert Entity extending Local Mechanic and implementing all the methods.

Also in terms of complexity "**Whenever abstraction decreases, complexity increases**"(Since our Expert Entity has very less abstraction, his complexity of work also increases)

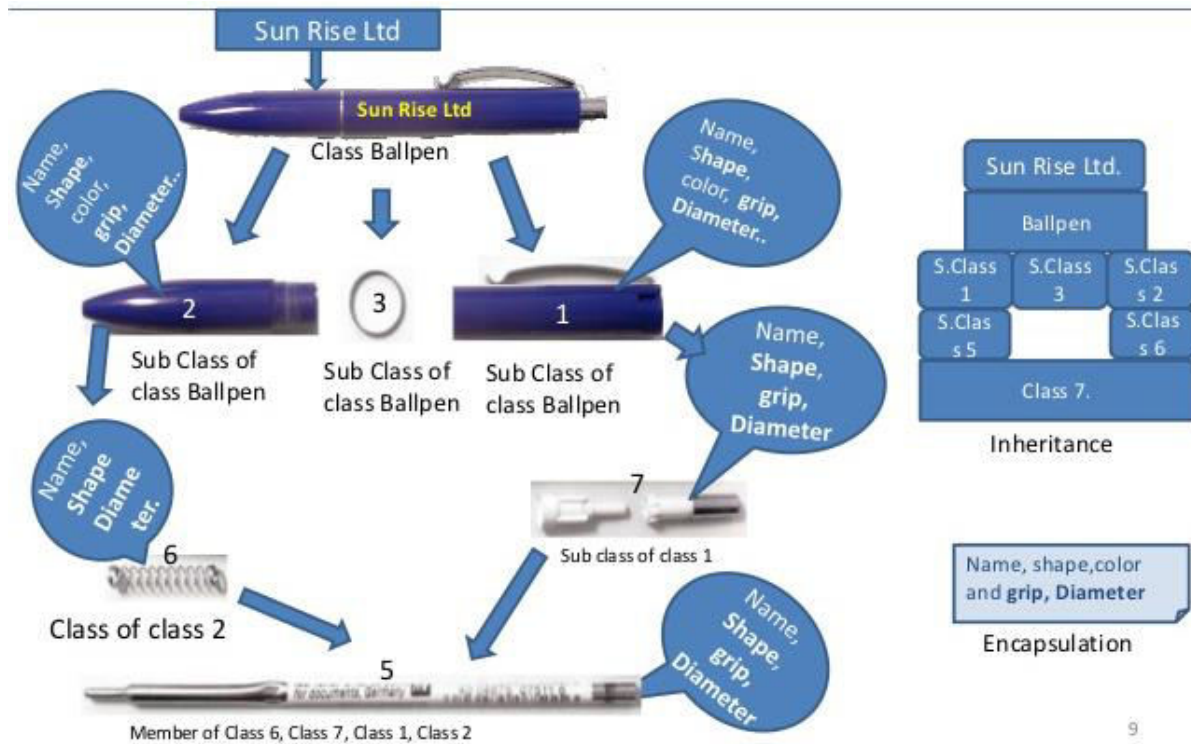
Case Study on Inheritance

Problem Statement: Means to inherit(adopt) the feature/functionality of base class and also add their own functionality.

Mapping with real world:

The process of eqiring the existing functionality of parent and with new added features and functionality of a child Object.

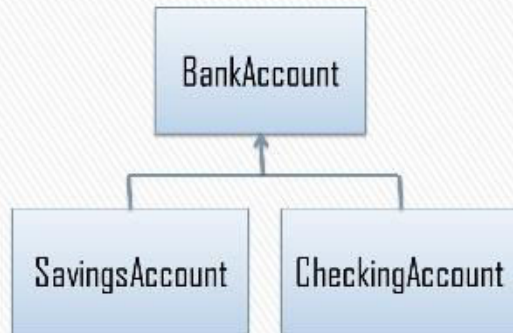
EXMPLE- a child inherit(adopt) some features of their parents & also add some features of their own.



From the above diagram we already understand that some of the properties remain same in the modified version of the pen. But the name and outlook of the class are different.

BankAccount Inheritance Example

- » **Savings Account** is a bank account with interest
- » **Checking Account** is a bank account with transaction fees



From the above diagram we already understand that some of the properties remain same in the classified version of the bank account. But they are ultimately belong to the same persons bank Account.



From the above diagram we already understand that some of the habits remain same in the next generation of any person.

Case Study on Polymorphism

Problem Statement: you can say that a object (person,place or thing) acts differently in different situations.

Mapping with real world:

An Object is in different forms and in each form its exhibit the same functionality but the implementation is different.

Eg: A Person who knows more than two languages he can speak in a language which he knows. Here person is Object and speak is polymorphisam.

POLYMORPHISM-

poly means "MANY" ,

morphism means "FORMS"..

MEANS many forms

or u can say that a object(person,place or thing) acts differently in different situations

example-

if a girl is married and mother of twins children doing teaching job den she is a women first .

Teacher in a school when she is in school,,wife of someone at home.

Mother of her children.

And obvious daughter of someone

Means a woman plays diffent roles at different times dats the polymorphism (many forms).

Polymorphism: It looks(by the name in programming) like same but expresses different characters. These twin brothers looks alike but they hold different characters.



Case Study on Encapsulation

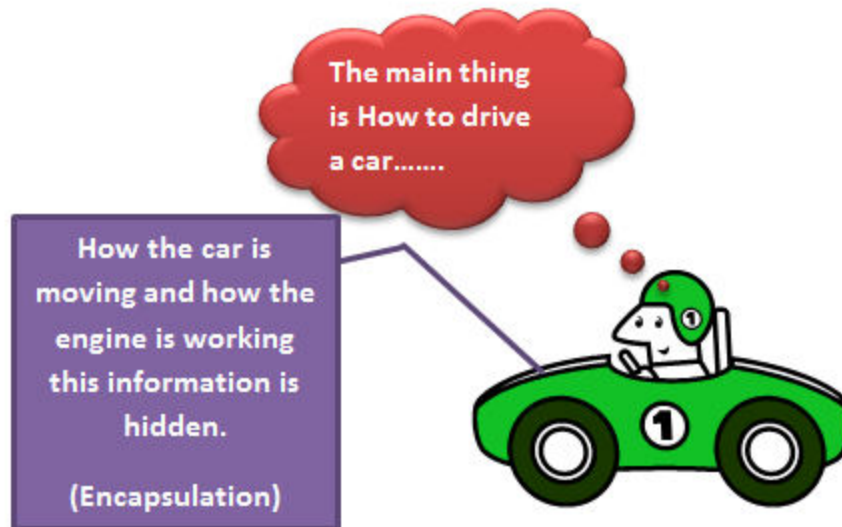
Problem Statement: "Encapsulation is to hide the variables or something inside a class, preventing unauthorized parties to use. So the public methods like getter and setter access it and the other classes call these methods for accessing".

Mapping with real world:

Let's imagine you own a Ferrari Car and you are the only one knows how to drive it in your family. One day a terrible breakdown happened to your car and you bring one mechanic to home and he checked it. But he is unable to repair it. So you contacted Ferrari company and some chief mechanic came to your home and repaired it(Since your car is under warranty, your pocket is still big :-))This is a real time example for the above mentioned OOP's concepts, How?

Encapsulation:

As a driver you know how to start the car by pressing the start button and internal details of the starting operations are hidden from you. So the entire starting process is hidden from you otherwise we can tell starting operation is encapsulated from you.



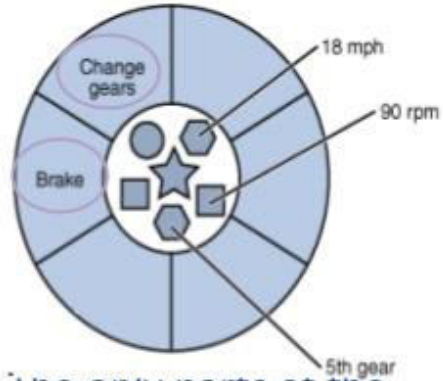
OR

Encapsulation

Some pictorial examples



- Internal mechanics of changing gears are (private) hidden from us: all we need to do is to use the public interface/panel (the gear rod) provided to us when we want to change gears.



- The only parts of the above object that are accessible to other objects would be the ones marked in red.

The driving wheel is encapsulated the process of rotating the wheel from you.

Case Study on Exception handling

Problem Statement: Exception handling is used when the frequency of occurrence of an exception cannot be predicted.

Mapping with real world:

1. you provide a web form for users to fill in and submit. but in case there are a lot of conditions to be handled and the conditions keep changing periodically, you use exception handling to simplify the process
2. database connectivity uses exception handling (why???) this is because the reason for database connectivity failure cannot be predicted and handled as it can be caused by many variables such as power failure, unreachable server, failure at client front/back end and so on.
3. internet communication
4. arithmetic exceptions such as division by zero and so on.
5. operating systems use exception handling to resolve deadlocks, recover from crash and so forth

There is a large amount of data to process.

E.g.: you want to make an image or set of images look nicer by applying a filter (e.g.: Valencia filter in Instagram). The computer you're working on has, let's say, 8 cores, so you can divide the total amount of work by 8 and assign the work to 8 different threads, to be finished up 8 times as fast as if you did it using one single thread. Caveat, you can't often make things speed up this much so cleanly, but when you can it's great.

Different tasks have different timeliness requirements.

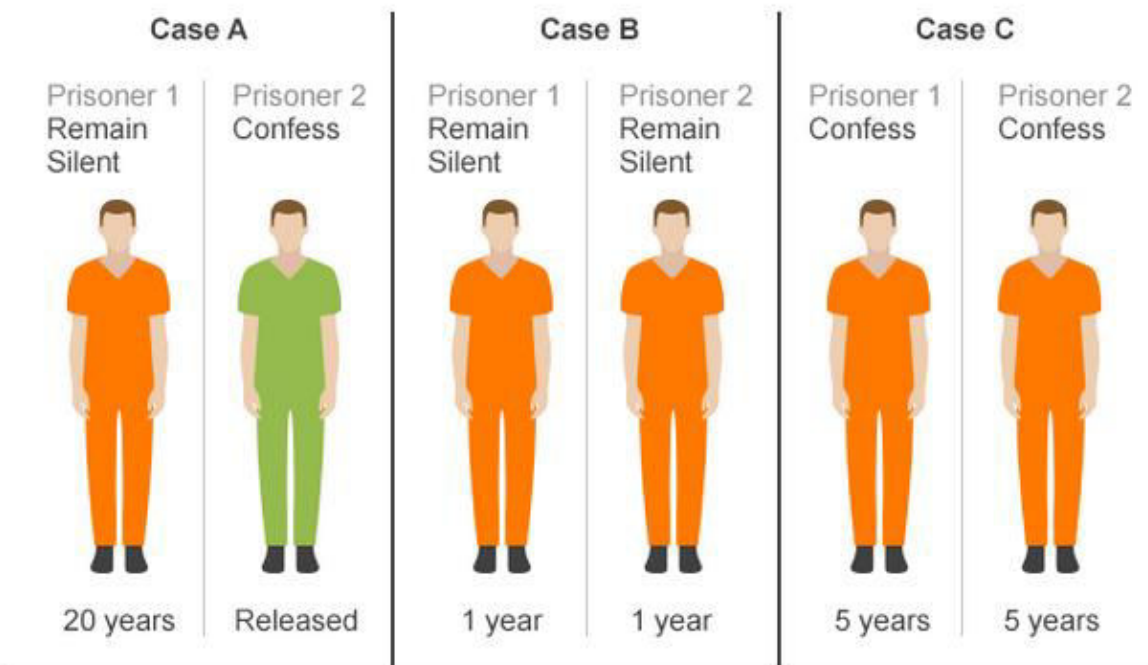
Most often, you run into this divide when your application has to perform tasks that need to happen immediately, in real-time (e.g.: updates to UI to indicate acknowledgement of a user action) and also tasks that will take an unpredictable amount of time and can be performed asynchronously in the background (e.g.: establishing a connection to a server somewhere in the internet, requesting and then downloading a video) while the application remains responsive.

CASE STUDY 1

Application OF Game Theory in Real Life

Problem: Imagine the following scenario. Two people committed a crime together and both got caught. They were put in different jail cells and told that whoever confesses first gets off without any jail time. The catch is that neither prisoner knows what the other one is going to do. The scenario can play out as follows:

Prisoners' dilemma



Now instead of this applying to two people, think broader. A good example would be a scenario in which a city is undergoing a drought. The city will ask its citizens to stop watering their lawns, take shorter showers and conserve water at the expense of their personal comfort. In many cases, restaurants will ask their customers if they want a glass of water instead of pouring it upon being seated. Now, imagine a restaurant that doesn't want to taint its stellar reputation and continues to serve water without asking. Or someone who continues to take long hot showers despite the bigger issue at hand. At the expense of the entire city, these people continue to consume potable water for their own personal comfort; the majority suffers because of the actions of the minority. But if no one splurges, then everyone has to endure uncomfortable conditions, but the water supply lasts longer. *If* everyone continues to use the water as they please, then the water will not last for very long; everyone remains comfortable but for a shorter period of time.

Keep in mind, everything is a calculated risk. In the case of the prisoner, the person confessing can only hope the other person did not confess. In the case of the people abusing the water, they can only hope that everyone else conserves and the drought does not last long.

This success and failure of this "calculated risk" can be seen in every aspect of our lives. The simplest way to understand this concept is through playing a game of chess.

Economics:

By investing in the stock market, you become a player. You have invested your money in a company knowing that you will either make money or lose money, but you don't know which. The company needs your investment to thrive. The decisions the company makes will either drive the price of its stock up or down, which determines its future success. The stockholder does not know what decisions the company will make, and the company does not know what decision the stockholder will make.

Gentrification:

Gentrification is a trend in urban neighbourhoods, which results in increased property values and the displacing of lower-income families and small businesses. This is a common and controversial topic in urban planning. Some say this is a trend, but I say this is a trend rooted in a very well calculated risk. People with money have power. If they know they can take over a neighbourhood by slowly up scaling it without much consequence, what's going to stop them? At one point this was a calculated risk for the wealthy. This is an example of game theory that has happened often enough to become a trend in urban neighbourhoods.

Political science:

Making a decision in times of a domestic or international political conflict is all about weighing the odds. The most weighted question politicians are faced with is: how will this affect my country in the future? Understanding the reactions, actions and decisions other politicians will make in reaction to one's decision is what makes this game theory. You do not know if the other politician is bluffing or serious. It's a judgement call. The best example of Game Theory in politics is the Cuban Missile Crisis.

These are just several examples of how applicable such an intriguing theoretical concept can be applied to world conflicts that in essence affect our daily lives. Just think, look around you and you will discover so much.

CASE STUDY 2

Application of Game Theory in Business Model Development

Problem: The application of game theory helps to develop business models for the purpose of managing interactions of decision makers either in a scenario of cooperative or a competitive approach of behaviour for conflict resolution.

A conflict occurs when paths are crossed. It means, when one decision making entity perceives the influence of others actions on its own achievement. When there is a conflict of interest, it is generally resolved through cooperative or competitive styles. Cooperative style is a win-win approach for problem solving while, competitive style is a win-lose way.

The application of game theory outside of a firm – an Example

A mathematical application of game theory for business decisions can be described in a table form. It's also known as the *Game's Normal Form* in mathematics.

The diagram below shows a simple matrix containing various sets of strategies. A set contain two strategies, one from you (in black) and the other by your competitor (in blue). While other factors are assumed constant and negligible, suppose both you and your only competitor decide to spend money on advertisement campaigns. These results, in relatively modest payoffs of \$400,000 for each (see the payoff pattern 4, 4).

Such set of decision strategy is known as Nash Equilibrium which implies neither entity can improve its profit, by changing its own strategy alone implying an interdependence of actions. Jon Forbes Nash explained this concept in 1950's. Furthermore it's visible in the famous Prisoners' Dilemma.

As another strategic possible measure, you and your competitor does not decide to advertise, get payoff of \$600,000 (see the pattern 6, 6). Remember that in some situations, no advertisement policy may result in reduced expenses and that's why more profit.

In the case, when, either you or your competitor alone decide to advertise, earn \$500,000 payoff on it. If you don't advertise, you have to bear a loss of -\$500,000, assuming your competitor utilizes your decision consequence as his/her opportunity (see the pattern -5, 5). In the very same way, if you advertise but your competitor does not, he/she has to suffer a loss of -\$500,000 (see the pattern 5, -5).



The Game's normal form
Payoff patterns (in hundred thousands of dollars\$)

The application of game theory inside a firm – An Example

For a layman the initial concept of the game theory might look like just as a strategic tool to boost competitive abilities of a firm against its competitors only. Actually, it can also be successfully applied inside a firm, in the perspective of considering various internal stakeholders of firm as players. One playing against another!

Here is an interesting example of application of game theory where two internal entities of a firm “playing” the game against each other. Remember, the purpose of each player is to “win” against the other. The strategies adoption to bring down the rival player, is purely motivated because of a simple fact, if one wins the other lose; (nobody wants to lose).

Let’s get back to the example.

We have two players in this game. The player A, a manager and the player B, workers. The manager’s objective is to increase workers efficiency. His gain lies in better efficiency of the workers. On the other hand, workers “gain” is in reduced efficiency assuming a lower efficiency level benefits them.

The manager wants to make workers more efficient without monitoring them, because it incur cost as well as it’s a necessary evil. However, the workers perceive monitoring threat as it compels them to work more along knowing, it’s also a weakness of the manager due to its extra costs.

The probability of opting monitoring depends upon the “gains” of workers in the form of reduced efficiency. In the same way the probability of reduced efficiency depends on how much it costs to the manager to monitor the workers. If the workers’ gains are greater, or if the expenses for the manager for monitoring them are great, the probability of reduced efficiency will increase as well. The game begins!

The possible results can be in the following four situations of:

1. Win-Win

2. Win-Lose
3. Lose-Win
4. Lose-Lose

<p>©managerial-economics-club.com</p> <p>Manager (Player A)</p>		Workers (Player B)	
		Inefficient	Efficient
→ Does not monitor		-2, +8	+8, +4
→ Monitors		-8, 0	+4, +4

Note: For the sake of simplicity take the table above as a scoreboard; black digit representing manager achievement and blue ones as workers'. The purpose is to understand comparative advantage or disadvantage through quantitative approach.

In the case of no Monitoring:

If the manager does not monitor and workers reduce efficiency, manager get -2 and workers gains by +8. This is win situation for the player B i.e. the workers and a loss for the manager.

Suppose workers remain efficient even without monitoring, their gain reduce to +4 from +8. Don't confuse yourself here by thinking, why the heck they remained efficient without monitoring. Take it just as a possibility (even if there is 0.000001% chance of such occurrence). It's a lose situation for the workers and a winning for the manager.

In the case of Monitoring:

If the manager monitors but still workers don't perform well, he faces a colossal loss as he has not only suffered monitoring cost, but also the reduced efficiency of the workers expressed as -8 for manager and 0 for workers.

The win-win situation lies in +4, +4. The manager monitors and the workers perform their duties well.

The effective Application of game theory concepts

You can use its concepts to develop effective and optimal competitive strategies for setting your product/service prices, the level of product quantity and quality, capital budgeting, auctioning, public policy making, research and development, cost management and advertising.

How can you develop game theory approaches?

First, what you need is to:

Asses the magnitude of the problem i.e. the cost-benefit aspect of the solution of a particular problem. If it's worth bothering about

Recognize your specific business type i.e. a production firm, consultancy, real estate etc. along the area of application i.e. inside or outside of organization. The purpose is to avoid wandering in the vast subject of the game theory and shooting the bulls' eye for time and money saving.

Customized solutions are only required, if problems are quite peculiar and are not of general nature, however most of issues are dealt with general understanding of basic game types mentioned in the articles. The related problems are also discussed under the umbrella of strategic management.

CASE STUDY 3

SOLVING THE REAL-LIFE LOCOMOTIVE SCHEDULING PROBLEM USING TRANSPORTATION

Transportation by railroads and airlines contains a rich set of optimization problems with substantial potential savings in transportation costs. In the past few decades, unfortunately, optimization models were not widely used in transportation industries, because of (i) the large size and tremendous complexity of these problems, (ii) the lack of suitable algorithmic approaches for solving them, and (iii) insufficient computing power available. However, as major advances have taken place in algorithm design, analysis and implementation, complemented by enhanced computer systems, transportation scheduling problems now appear to be tractable.

The goal of this dissertation is to study several real-life transportation scheduling problems that are of great importance for railroads and airlines. The related literatures of these problems have only dealt with simplified models or small instances failing to incorporate the characteristic of real-life applications.

Introduction: Transportation is one of the most vital services in modern society. Transportation of goods by railroads is an integral part of the U.S. economy. Railroads play a leading role in multi-modal and container transportation. The rail transportation industry is very rich in terms of problems that can be modeled and solved using mathematical optimization techniques. However, research in railroad scheduling has experienced a slow growth and, until recently, most contributions used simplified models or had small instances failing to incorporate the characteristics of real-life applications. The strong competition facing rail carriers (most notably from trucking companies) and the ever increasing speed of computers have motivated the use of optimization models at various levels in railroad organizations. In addition, recently proposed models tend to exhibit an increased level of realism. As a result, there is growing interest for optimization techniques in railroad problems.

In this section, we give the details and notation of the locomotive scheduling problem used for planning at CSX.

Train Data:

Locomotives pull a set L of trains from their origins to destinations. The train schedule is assumed to repeat from week to week. Trains have different weekly frequencies; some trains run every day, while others run less frequently. We will consider the same train running on different days as different trains;

that is, if a train runs five days a week, we will consider it as five different trains for which all data is the same except that they will have different departure and arrival times.

We use the index l to denote a specific train. For the planning model, the train schedule is deterministic and pre-specified. There are three classes of trains: Auto, Merchandize, and Intermodal. Each train belongs to exactly one class. The required tonnage and horsepower is specified. The tonnage of a train represents the minimum pulling power needed to pull the train. The tonnage depends upon the number of cars pulled by the train, weight of the cars, and the slope or ruling grade of that train's route. The horsepower required by the train is its tonnage multiplied by the factor that we call the horsepower per tonnage. The greater the horsepower per tonnage, the faster the train can move. Different classes of trains have different horsepower per tonnage. For greater model flexibility, we allow each train to have its own horsepower per tonnage. We associate the following data with each train l .

$dep-time(l)$: The departure time for the train l . We express this time in terms of the weekly time as the number of minutes past Sunday midnight. For example, if the train l leaves on Monday 6 AM, then $dep-time(l) = 360$; and if it leaves on Tuesday 6 AM, then $dep-time(l) = 1,800$.

$arr-time(l)$: The arrival time for train l (in the same format as the $dep-time(l)$).

$dep-station(l)$: The departure station for train l .

$arr-station(l)$: The arrival station for train l .

T_l : Tonnage requirement of train l .

β_l : Horsepower per tonnage for train l .

H_l : Horsepower requirement of train l , which is defined as $H_l = \beta_l T_l$.

E_l : The penalty for using a single locomotive consist for train l .

Locomotive Data:

A railroad company typically has several different types of locomotives with different pulling and cost characteristics and different number of axles (often varying from 4 to 9). Locomotives with different characteristics allow railroads greater flexibility in locomotive assignments, but also make the locomotive scheduling problem substantially more difficult. We denote by K the set of all locomotive types, and use the index k to represent a particular locomotive type. We associate the following data with each train k

K :

h_k : Horsepower provided by a locomotive of type k .

α_k : Number of axles in a locomotive of type k .

G_k : Weekly ownership cost for a locomotive of type k .

B_k : Fleet size of locomotives of type k , that is, the number of locomotives available for assignment.

Active and Deadheaded Locomotives:

Locomotives assigned to a train either actively pull the train or deadhead. Deadheading allows extra locomotives to be moved from places where they are in surplus to the places where they are in short supply. For example, more tonnage leaves a coal

mine than arrives at the coal mine; so more pulling power is needed on trains departing from the mine. This creates a demand for locomotives at the mine. Similarly, more tonnage arrives at a thermal power plant than leaves it; so more pulling power is needed on trains arriving at the power plant. This creates a surplus of locomotives at the power plant. Effective deadheading of locomotives reduces the total number of locomotives used and improves the average locomotive utilization. We need the following data for train-locomotive type combinations:

cl_k : The cost incurred in assigning an active locomotive of type k to train l .

dl_k : The cost incurred in assigning a deadheaded locomotive of type k to train l .

tlk : The tonnage pulling capability provided by an active locomotive of type k to train l .

The active cost clk captures the economic asset cost of the locomotive for the duration of the train and the fuel and maintenance costs. The deadhead cost dlk captures the same asset cost, a reduced maintenance cost, and zero fuel cost. Observe that the tonnage provided by a locomotive depends upon the train. Different train routes have different ruling grades (that is, slopes) and the pulling power provided by a locomotive type is affected by the ruling grade.

Also specified for each train l are three disjoint sets of locomotive types: (i) $MostPreferred_l$, the preferred classes of locomotives; (ii) $LessPreferred_l$: the acceptable (but not preferred) classes of locomotives; and (iii) $Prohibited_l$, the prohibited classes of locomotives. CSX uses business rules based on train types and geographical considerations to determine these classes for each train. When assigning locomotives to a

train, we can only assign locomotives from the classes listed as $MostPreferred_l$ and $LessPreferred_l$ (a penalty is associated for using $LessPreferred_l$).

Light Travel:

Our model allows light travel of locomotives, that is, locomotives traveling in a group on their own between different stations to reposition themselves. Similar to deadheading, light travel can be an effective way to reposition locomotives. The light travel cost has a fixed component that depends upon the distance of travel in the light move since we need a crew, and a variable component that depends upon the number of locomotives light traveling.

Consist-Busting:

Consist-busting is a normal phenomenon in railroads because the needs for outgoing locomotives at a station do not precisely match the incoming needs. However, consist-busting incurs a cost in complexity of managing the system, and in delays in repositioning locomotives. Consist-busting can be reduced by a better scheduling of locomotives. We model the cost of consist-busting with a fixed component, B , per consist-busting and a variable component that depends upon the number of locomotives involved in the consist-busting.

We will now describe the constraints in the LSM. The constraints can be classified into two parts: hard constraints (which each locomotive assignment must satisfy) and soft constraints (which are desirable but not always required to be satisfied). We incorporate soft constraints by attaching a penalty for each violation of these constraints.

Hard Constraints:

Power requirement of trains: Each train must be assigned locomotives with at least the required tonnage and horsepower.

Locomotive type constraints: Each train l is assigned locomotive types belonging to the set $MostPreferred_l$ and $LessPreferred_l$ only.

Locomotive balance constraints: The number of incoming locomotives of each type into a station at a given time must equal the number of outgoing locomotives of that type at that station at that time.

Active axles constraints: Each train must be assigned locomotives with at most 24 active axles. This business rule is designed to protect the standard couplers used in North America. Exceeding 24 powered axles may result in overstressing the couplers and causing a train separation.

Consist size constraints: Each train can be assigned at most 12 locomotives including both the active and deadheaded locomotives. This rule is a business policy of CSX that reduces its risk exposure if the train were to suffer a catastrophic derailment.

Fleet size constraints: The number of assigned locomotives of each type is at most the number of available locomotives of that type.

Repeatability of the schedule: The number and type of locomotives positioned at each station at the beginning of the week must equal the number and type of locomotives positioned at that station at the end of the week. This ensures that the assignment of locomotives can be repeated from week to week.

Soft Constraints:

Consistency in locomotive assignment: If a train runs five days a week, then it should be assigned the same consist each day it runs. CSX believes that crews will perform more efficiently and more safely if they operate the same equipment on a particular route and train. As the crews learn the operating nuances associated with each combination, they will adjust their throttle and braking control accordingly.

Consistency in train-to-train connections: If locomotives carrying a train to its destination station connect to another train originating at that station, then it should preferably make the same connection on each day both the trains run. This is useful to help terminal managers optimize their sub-processes associated with arriving and departing trains.

Same class connections: Trains should connect to other trains in the same class, e.g., auto trains should connect to auto trains; merchandise trains should connect to merchandise trains, etc. This is useful in that different trains have different preferred types of locomotives and may originate and terminate at different locations within a larger terminal area (an unloading ramp, for example).

Avoid consist-busting: Consist-busting should be avoided as much as possible.

Objective Function:

The objective function for the locomotive scheduling model contains the following terms:

Cost of ownership, maintenance, and fueling of locomotives

Cost of active and deadheaded locomotives

Cost of light traveling locomotives

Penalty for consist-busting

Penalty for inconsistency in locomotive assignment and train-to-train connections

Penalty for using single locomotive consists

Space-Time Network

We will formulate the locomotive scheduling problem as a multicommodity flow problem with side constraints on a network, which we call the weekly space-time network. Each locomotive type defines a commodity in the network. We denote the space-time network as $G7 = (N7, A7)$, where $N7$ denotes the node set and $A7$ denotes the arc set. We construct the weekly space-time network as follows. We create a train arc (l', l'') for each train l ; the tail node l' of the arc denotes the event for the departure of train l at $\text{dep-station}(l)$ and is called a departure node. The head node l'' denotes the arrival event of train l at $\text{arr-station}(l)$ and is called an arrival node. Each arrival or departure node has two attributes: place and time. For example, $\text{place}(l') = \text{dep-station}(l)$ and $\text{time}(l') = \text{dep-time}(l)$. Similarly, $\text{place}(l'') = \text{arr-station}(l)$ and $\text{time}(l'') = \text{arr-time}(l)$. Some trains are called forward trains and some trains are called backward trains. Forward trains are those trains for which $\text{dep-time}(l) > \text{arr-time}(l)$ and backward trains are those trains for which $\text{dep-time}(l) < \text{arr-time}(l)$. For example, a train that leaves on Monday and arrives at its destination on Tuesday is a forward train; whereas a train that

leaves on Saturday and arrives on Monday is a backward train. (Recall that our timeline begins on Sunday at midnight.)

To allow the flow of locomotives from an inbound train to an outbound train, we introduce *ground nodes* and *connection arcs*. For each arrival node, we create a corresponding *arrival-ground node* with the same place and time attribute as that of the arrival event. Similarly, for each departure event, we create a *departure-ground node* with the same place and time attribute as that of the departure node. We connect each arrival node to the associated arrival-ground node by a directed arc called the *arrival-ground connection arc*. We connect each departure-ground node to the associated departure node through a directed arc called the *ground-departure connection arc*. We next sort all the ground nodes at each station in the chronological order of their time attributes, and connect each ground node to the next ground node in this order through directed arcs called *ground arcs*. (We assume without any loss of generality that ground nodes at each station have distinct time attributes.) The ground nodes at a station represent the pool (or storage) of locomotives at the station at different instants of times, when events take place. As trains arrive, they bring in locomotives to the pool through arrival-ground connection arcs. As train departs, they take out locomotives from the pool through ground-departure connection arcs. The ground arcs allow inbound locomotives to stay in the pool as they wait to be connected to

the outbound trains. We also connect the last ground node in the week at a station to the first ground node of the week at that station through the ground arc; this ground arc models the ending inventory of locomotives for a week becoming the starting inventory for the following week.

We also model the possibility of an inbound train sending its entire consist to an outbound train. We capture this possibility by creating train-train connection arcs from an arrival node to those departure nodes whenever such a connection can be feasibly made. Railroads have some business rules about which train-train connections can be feasibly made. The arrival nodes i'' for a train i can be connected to a departure node j' for train j provided $\text{min-connection-time} \leq \text{dep-time}(j) - \text{arr-time}(i) \leq \text{max-connection-time}$, where $\text{min-connection-time}$ and $\text{max-connection-time}$ are two specified parameters. For example, $\text{min-connection-time} = 120$ (in minutes) and $\text{max-connection-time} = 480$.

We also allow the possibility of light travel, that is, several locomotives forming a group and traveling on their own as a group from one station to another station. Using a method described later in Section 2.6.4, we create possibilities for light travel among different stations. We create a light arc in the weekly space-time network corresponding to each light travel possibility. Each light arc originates at a ground node (with a specific time and at a specific station) and also terminates at a ground node. Each light arc has a fixed charge which denotes the fixed cost of sending a single locomotive with crew from the origin of the light arc to its destination. We denote this fixed charge for a light travel arc l by F_l . The light arc also has a variable cost which depends upon the number of locomotives light traveling as a group.

To summarize, the weekly space-time network $G = (N, A)$ has three types of nodes

arrival nodes (ArrNodes), departure nodes (DepNodes), and ground nodes (GrNodes); and four kinds of arcs - train arcs (TrArcs), connection arcs (CoArcs), ground arcs (GrArcs) and light travel arcs (LiArcs). Let $\text{AllNodes} = \text{ArrNodes} \cup \text{DepNodes} \cup$

GrNodes , and $\text{AllArcs} = \text{TrArcs} \cup \text{CoArcs} \cup \text{GrArcs} \cup \text{LiArcs}$. We show in Figure 2-1, a

part of the weekly space-time network at a particular station, which illustrates various kinds of arcs.

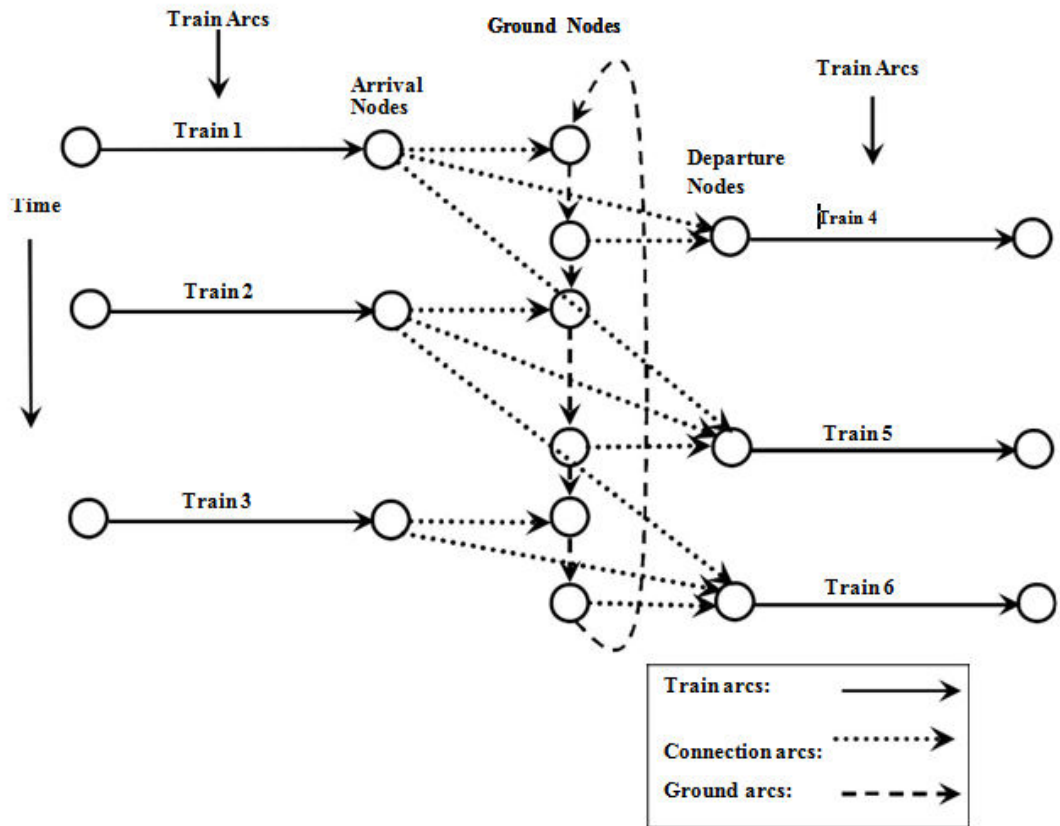


Figure 2-1. A part of the weekly space time network

CASE STUDY 4

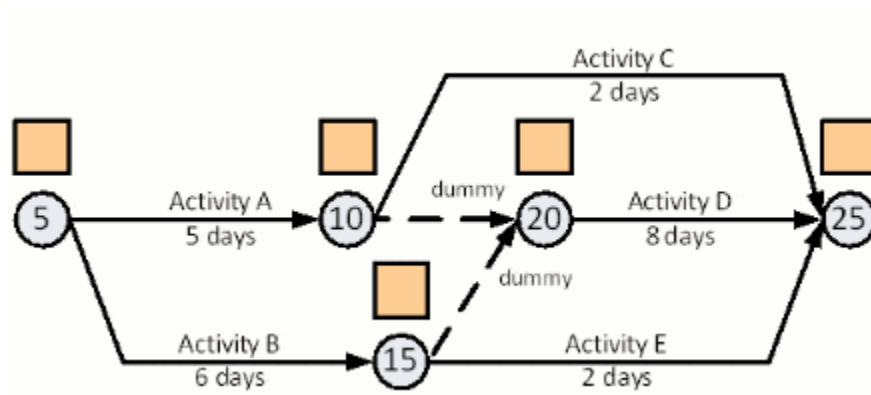
Uses of CPM and PERT in Construction Projects

Problem: For a construction project type, which have not been completed anywhere in the past, when it is possible to say that with reasonable accuracy that an activity “A” has to be completed before activity “B”, but the time required to complete the activity “A” is not known or the completion time of activity “B” is uncertain, in that case PERT technique is used.

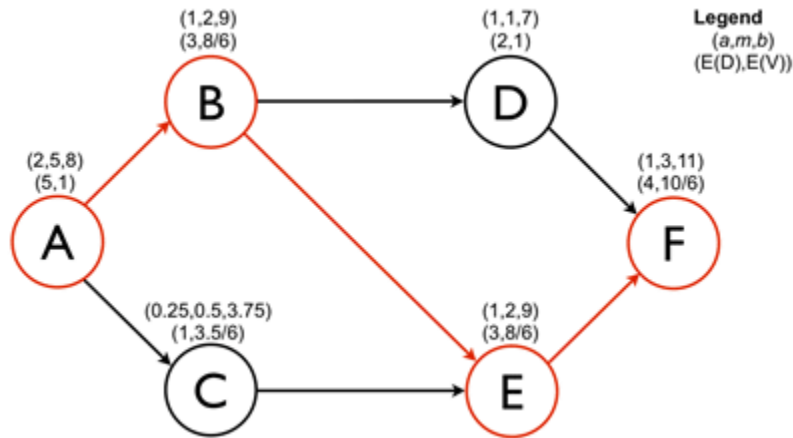
This technique is based on the probabilities of completing each activity in time. The time is not of much importance in this technique, and completion of each event is taken care of. This technique is therefore most suited to projects like research and development, investigation, design etc. Also PERT because of the large number of calculations involved is essentially a computer-based system.

CPM and PERT in construction projects are the tools used for efficient management of activities. CPM is Critical Path Method and PERT is Program Evaluation and Review Technique.

The Critical Path Method (CPM) was first used during the overhauling of a chemical plant in United States in the year 1950 by Morgan R. Walker of DuPont and James E. Kelley, Jr. of Remington Rand. By using this technique of activity management, they substantially reduced the time of overhauling of the chemical plant.



Program Evaluation and Review Technique (PERT) was first used in 1957 in United States for the design and development of the Polaris missile. With the objective of meeting a specified completion date for the project two years in advance of the earliest possible date predicted by traditional planning methods the U.S. Naval dept. devised this new technique.



CPM and PERT in Construction Projects:

The difference between the CPM and PERT is that the PERT is mainly used where the time required for completion of each of the activities involved cannot be accurately defined nor are the resources to be used for the activity readily available. The events could however be readily definable.

For example, for a construction project type, which have not been completed anywhere in the past, when it is possible to say that with reasonable accuracy that an activity “A” has to be completed before activity “B”, but the time required to complete the activity “A” is not known or the completion time of activity “B” is uncertain, in that case PERT technique is used.

This technique is based on the probabilities of completing each activity in time. The time is not of much importance in this technique, and completion of each event is taken care of. This technique is therefore most suited to projects like research and development, investigation, design etc. Also PERT because of the large number of calculations involved is essentially a computer-based system.

CPM technique is used in construction projects based on the knowledge and experience of the past projects for predicting accurately the time required for various activities during the execution of the project. Time required for each activity is known and defined for the project.

Hierarchy of the construction project events are well defined and time of completion of the same is also defined. The total time required for the given project can be estimated based on this technique.

CPM is an activity oriented system as the times required for construction activities are estimated more accurately. CPM is used where activities are definable and measurable and minimum overall cost is of the utmost importance.

Most large projects can be portrayed by a graph or network of jobs. **Characteristics of construction projects** to make it amenable for analysis by PERT or CPM are:

(a) The project must consist of a well defined collection of jobs or activities which when completed will mark the end of the project.

(b) The jobs must be such that they can be started or stopped independently of each other within a given sequence, (e.g. certain continuous flow processes such as oil refining, where jobs or

operations must follow one after another with essentially no time separation, are not amenable for analysis by PERT or CPM).

(c) The jobs are ordered i.e. they must be performed in Technological sequence (e.g. the foundation of a wall must be completed before the wall can be built).

PERT and CPM are tools used for managing the construction project activities and if followed thoroughly, the construction project can be completed within the time limit and within the cost. But use of these tools does not guaranty the desired outcome due to bad management problems, natural calamities, strikes by labors etc.

Howsoever good a tool may be, its success depends on how well the tool is used. The CPM Network affords management with information for taking decisions and focusing its attention to essential operations.

CASE STUDY 5

We will see in this section a practical solution worked example in a typical maximize problem. Sometimes it is hard to get to raise the linear programming, once done, we will use the methods studied in mathstools theory sections: Simplex, dual and two-phase methods.

We start with the statement of an optimization problem

Problem: A mining company produces lignite and anthracite.

By the moment, it is able to sell all the coal produced, being the profit per ton of lignite and anthracite 4 and 3 monetary units, respectively. Processing each ton of lignite requires 3 hours of coal cutting machine and another 4 hours for washing.

Also, the processing of one ton of anthracite required for same tasks 4 and 2 hours, respectively the time available daily to each of these activities (cutting and washing) is 12 and 8 hours respectively. Furthermore, it is desired to produce daily least 4 tons of coal.

1) Present the linear programming problem to determine the number of tons of lignite and anthracite to be produced daily in order to maximize gains.

2) Using the Simplex algorithm to solve the problem by the two phase method

Solution:

We start understanding the problem. For this we construct the following tables

The first is the cost, or in this case, is a table of gains.

Material	Gains produced (monetary units /Tn)
Lignite	4
Anthracite	3

Material	Cutting hours (by Tn)	Washing time (by Tn)
Lignite	3	4
Anthracite	4	2

Attached to this table, we have the constraint of time available for each machine daily

Process	Hours available daily
Washing	8

and finally, we have the objective produce at least 4 tons of coal daily Extended Theory

With these data, we have what we need to pose the problem of linear programming.

We proceed as follows:

Lets

x_1 =Tons of lignite produced

x_2 =Tons of Anthracite produced

We want to maximize the gains, ie, maximize the function $4x_1 + 3x_2$, this will be our objective function.

now building restrictions

We start with the washing process, note that for every day we have

$$3x_1 + 4x_2 \leq 12$$

Since for every day the number of hours available washing is 12.

Analogously we have for the cutting process

$$4x_1 + 2x_2 \leq 8$$

Because 8 is the number of hours available for the cutting machine.

Finally, the last of the restrictions is our goal tons of production

$$x_1 + x_2 \geq 4$$

Putting it together, we obtain the linear programming problem

Maximize $(4x_1 + 3x_2)$

Subject to

$$3x_1 + 4x_2 \leq 12$$

$$4x_1 + 2x_2 \leq 8$$

$$x_1 + x_2 \geq 4$$

$$x_1, x_2 \geq 0$$

Now, we can solve the linear programming problem using the simplex or the two phase method

if necessary as we have seen in sections of theory In this case we use our famous calculator usamos linear programming problems simplex method calculator

We placed each of the steps, first introduce the problem in the program

Cost vector	
c0	c1
4	3

Constraints matrix		Signs	b
x0	x1	Sign	x0
3	4	≤	12
4	2	≤	8
1	1	≥	4

Step 1:

Waiting for next Iteration										
x _{b0}	C _{b1}	Basis2	x ₀	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇
-1	x ₅	3	4	1	0	0	1	0	0	0
-1	x ₀	4	2	0	1	0	0	1	0	0
-1	x ₇	1	1	0	0	-1	0	0	0	1
	z _j -c _j ->	-8	-7	-1	-1	1	0	0	0	0

[Next Step](#) [Go to End](#)

Waiting for next Iteration. Step: 1

Step 2:

Waiting for next Iteration										
x _{b0}	C _{b1}	Basis2	x ₀	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇
-1	x ₁	0	5/2	1	-3/4	0	1	-3/4	0	0
0	x ₀	1	1/2	0	1/4	0	0	1/4	0	0
-1	x ₇	0	1/2	0	-1/4	-1	0	-1/4	1	0
	z _j -c _j ->	0	-3	-1	1	1	0	2	0	0

[Next Step](#) [Go to End](#)

Step 3:

No solution found. Constraints are incompatible										
x _{b0}	C _{b1}	Basis2	x ₀	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	x ₇
0		x ₁	0	1	2/5	-3/10	0	2/5	-3/10	0
0		x ₀	1	0	-1/5	2/5	0	-1/5	2/5	0
-1		x ₇	0	0	-1/5	-1/10	-1	-1/5	-1/10	1
		z _j -c _j ->	0	0	1/5	1/10	1	6/5	11/10	0

No solution found. Constraints are incompatible. Step: 3

As can be seen, the output of method has gone unresolved optimal solution, this is because the restrictions are too strong, the feasible region is empty.

We will have to alter some (or more) of our restrictions for it, talk to the owner of the factory and send him an email, saying that it is not possible to produce 4 tons of coal daily and meet all these constraints, there are two options

- 1) Relax our objective function or
- 2) Relax constraints.

The chief replied that there was an error, and that the real goal is to produce 3 tons of coal (things that happens). We introduce this new information in our linear programming problem, that is, change the last of the restrictions

$$x_1 + x_2 - x_3 \leq 3$$

We introduce the problem again simplex method calculator and now yes, we get

Optimal finite solution found							
x _{b0}	C _{b1}	Basis2	x ₀	x ₁	x ₂	x ₃	x ₄
0		x ₄	0	0	1/5	1/10	1
4		x ₀	1	0	-1/5	2/5	0
3		x ₁	0	1	2/5	-3/10	0
		z _j -c _j ->	0	0	2/5	7/10	0

Optimal finite solution found. Step: 5

Pivot	5
Optimal	10.399999999999999
Elapsed	0.0010 secs.
Solution	x ₄ =1/5, x ₀ =4/5, x ₁ =12/5

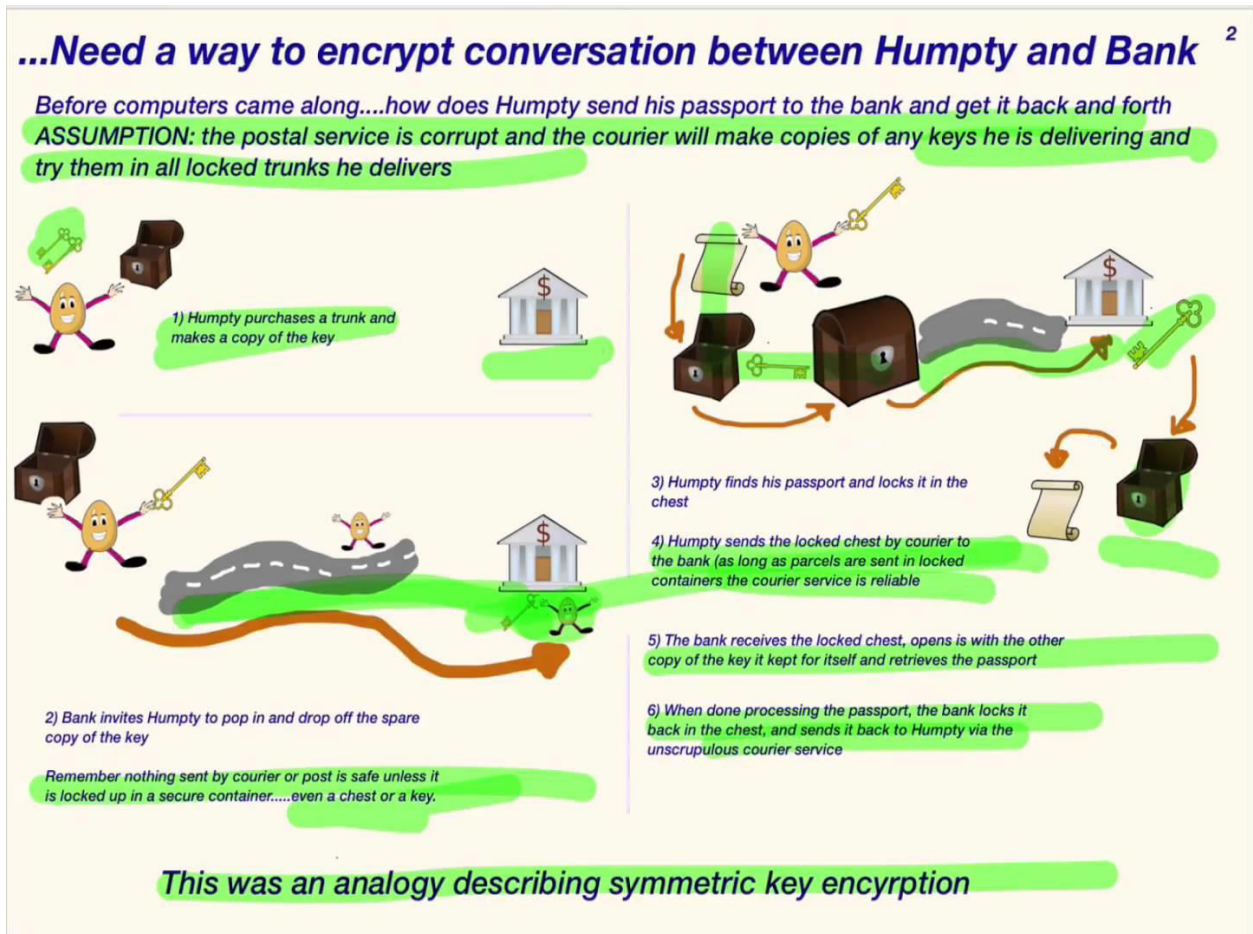
So, we talk again to the boss and say that the most we can produce with these restrictions is

$x_1 = 4/5$ Tn de lignite/day $x_2 = 12/5$ Tn Anthracite/day

Case study of Symmetric key

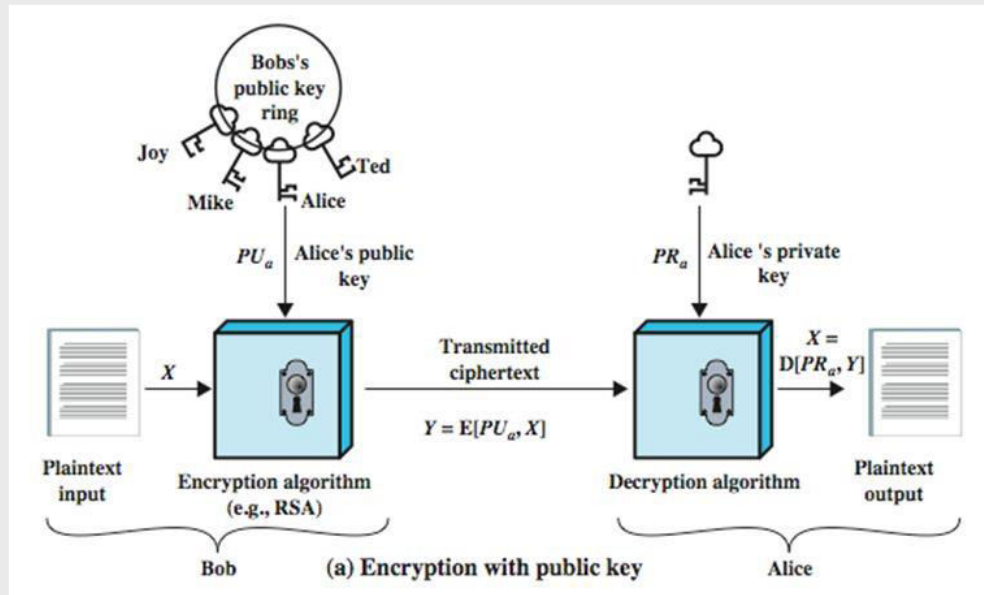
Problem Statement: Symmetric study

Mapping with real world:



This is real life key concept of bank and customer .by this image we can easily understand how we can access our own locker in bank

Public-Key Cryptography



For confidentiality

public-Key Applications

can classify uses into 3 categories: encryption/decryption (provide secrecy) digital signatures (provide authentication) key exchange (of session keys) some algorithms are suitable for all uses, others are specific to one Public-key systems are characterized by the use of a cryptographic type of algorithm with two keys. Depending on the application, the sender uses either the sender's private key or the receiver's public key, or both, to perform some type of cryptographic function. In broad terms, we can classify the use of public-key cryptosystems into the three categories:

- Encryption/decryption: The sender encrypts a message with the recipient's public key.
- Digital signature: The sender "signs" a message with its private key, either to the whole message or to a small block of data that is a function of the message.
- Key exchange: Two sides cooperate to exchange a session key. Several different approaches are possible, involving the private key(s) of one or both parties.

Case study of Authentication

Problem Statement: Biometric Authentication.

Mapping with real world:

Biometric is one authentication method. It consists in identifying people by recognizing one or several physical characteristics. It is probably one of the future main solutions for providing authentication. There are several types of authentication, based on different aspects of a user. As Matt Bishop says in his book "Introduction to Computer Security", authentication can be based on:

- What this user has, for example a key.
- What this user knows, for example a password.
- Where this user is, for example IP-address.
- What this user is: biometrics methods.

Each of these methods has some advantages and drawbacks. Depending on what you want to provide, you have to think of what is the best method for your specific case. You may want something cheap, or easy to use, or really secure. You have to reach a compromise between these aspects. For example, passwords are really cheap and easy to use, but if a password is not strong enough, it is not a secure authentication method. In this document, we will provide an overview of the different biometrics methods and see which ones are used. Then, we will discuss the advantages and drawbacks of the biometric among the authentication methods.

Physiological biometric

Fingerprints

This is the most known method that belongs to this category. It is also the oldest biometric authentication approach. It is based on the recognition of someone's fingerprint, by analyzing its characteristics. There are two different techniques to capture fingerprints. The first is by scanning optically the finger. The other method is by using electrical charges, that determines which parts of the finger are directly in contact with the sensor and which are not. Each fingerprint has some characteristics, such as curves, bifurcations, deltas. One set of these characteristics is unique for each person. Moreover, if your finger is little dirty, or if cut yourself, it will work as well, because the main characteristics of your fingerprint are not changed. A vulnerability of this method is reproducing a fingerprint for example with silicone. For the optical devices, even a picture of a fingerprint can fool the device. Fingerprints are commonly used in a lot of organization. Moreover you can find fingerprints readers easily.

Eyes

There are two methods using the eyes characteristics for authentication. The first is based on the retinal recognition. The user has to look in a device that performs a laser-scanning of his retina. The device analyzes the blood vessels configuration of the acquired retinal picture. By the way, it authenticates the user. This blood vessels configuration is unique for each eye. The device is not friendly, because you have to fix a point while a laser is

analyzing your eye. It seems difficult to fool the authentication system. The second method is based on the iris recognition. The scan is done by a camera. Unlike the retinal method, you don't need to be close to the device to be authenticated. The acquired picture is analyzed by the device, and contains 266 different spots. It is said that it is the most reliable biometric authentication method.

DNA

This method is based on a DNA analysis. To perform a DNA analysis the user has to give some of his cells, for example by giving a hair, or some skin. Analyzing DNA takes a long time. That's why it is not used as an authentication method. It is a shame that it can not be used easily, because it would have provided an excellent authentication, because everyone is unique through his DNA. But it can be easily fooled, because anyone can steal a hair of somebody else. Maybe researchers will find a good way to implement such devices, and it will maybe become the most efficient way of authenticate people. Moreover iris is stable through the whole life. The 266 spots are based on characteristics of the iris, such as furrows and rings. Like for the retinal recognition, the iris recognition seems difficult to be fooled. Both methods are currently in developing state. Some prototypes are already available.

Behavioral biometric

Signature

The analysis of signature is also a biometrical authentication solution. The device is a tactile screen. The user performs a signature with a "pen" on this tactile screen. The parameters that are computed for the authentication are the shape of the signature, the time taken to do it, the stroke order and the pen pressure. With the computation of these parameters, the system provides to you a unique authentication method. It is virtually impossible to reproduce in the same way somebody else's signature. This method is not deployed today, but it will be more used in the future. It is easy to implement and it will be standardize, so it will become quite cheap.

Case study of Hacking

Problem Statement: ETHICAL HACKING: A TECHNIQUE TO ENHANCE INFORMATION SECURITY

Mapping with real world:

The vast growth of Internet has brought many good things like electronic commerce, email, easy access to vast stores of reference material etc. As, with most technological advances, there is also other side: criminal hackers who will secretly steal the organization's information and transmit it to the open internet. These types of hackers are called black hat hackers. So, to overcome from these major issues, another category of hackers came into existence and these hackers are termed as ethical hackers or white hat hackers. So, this paper describes ethical hackers, their skills and how they go about helping their customers and plug up security holes. Ethical hackers perform the hacks as security tests for their systems. This type of hacking is always legal and trustworthy. In other terms ethical hacking is the testing of resources for the betterment of technology and is focussed on securing and protecting IP systems. So, in case of computer security, these tiger teams or ethical hackers would employ the same tricks and techniques that hacker use but in a legal manner and they would neither damage the target systems nor steal information. Instead, they would evaluate the target system's security and report back to the owners with the vulnerabilities they found and instructions for how to remedy them. Ethical hacking is a way of doing a security assessment. Like all other assessments an ethical hack is a random sample and passing an ethical hack doesn't mean there are no security issues. An ethical hack's results is a detailed report of the findings as well as a testimony that a hacker with a certain amount of time and skills is or isn't able to successfully attack a system or get access to certain information. Ethical hacking can be categorized as a security assessment, a kind of training, a test for the security of an information technology environment. An ethical hack shows the risks an information technology environment is facing and actions can be taken to reduce certain risks or to accept them.

Overview of Hacking

❖ Hack

- Examine something very minutely
- The rapid crafting of new program or the making of changes to existing, usually complicated software

❖ Hacker

- The person who hacks

❖ Cracker

- System intruder/ destroyer



HACKER GOOD, CRACKER BAD Although the term “hacker” is in widespread use, the sense in which it is employed is generally incorrect. Popular media and entertainment providers have long used it to describe anyone who tampers with a system, particularly in connection to criminal activity. This journalistic misuse of the name upset many “traditional” hackers, who responded to the vilification of their good name by offering a new term for these individuals: “crackers.” Crackers are vandals and thieves whose sole purpose is unauthorized “cracking” into secure systems for personal gain.⁵ This darker side of hacking has three main motivations with varying degrees of harm. The most benign cracks are attempts to gain unauthorized access in order to satisfy a personal motive such as curiosity or pride. More malicious cracking seeks to gain unauthorized access in order to tamper with or destroy information. The goal of the most serious and professional crackers is unauthorized access to systems or computer services in order to steal data for criminal purposes. Systems commonly under attack are universities, government agencies, such as the Department of Defence and NASA, and large corporations such as electric utilities and airlines. Many crackers are professional criminals involved in corporate or government espionage and have links to organized crime. A relative newcomer to the “hacker” field, script kiddies are another break-off group mistakenly called hackers by the media. A lower form of crackers, script kiddies are not particularly knowledgeable about computer and networking details. Instead, they download readymade tools to seek out weaknesses on systems

accessible via the Internet. They do not target specific information or a specific company but rather scan for opportunities to disrupt and vandalize systems. Most “hackers” and “hacking” events reported on by the popular press are actually of this type.

CRIMINALIZATION Legislators and law enforcement began to get serious about criminalizing and prosecuting these activities in the mid-1980s. Congress passed its first hacking-related legislation, the Federal Computer Fraud and Abuse Act, in 1986. The act made computer tampering a felony crime punishable by significant jail time and monetary fines. By the mid-1990s several high-profile arrests had taken place and signalled the seriousness with which government and businesses were dealing with these activities. Kevin Mitnick, perhaps the best known hacker of this era, was arrested twice, served significant jail time, and was barred from touching a computer for several years after completing his sentence.

Case study of watermarking

Problem Statement: Digital watermarking Technique

Mapping with real world:

Introduction Digital watermarking is the act of hiding a message related to a digital signal (i.e. an image, song, video) within the signal itself. It is a concept closely related to steganography, in that they both hide a message inside a digital signal. However, what separates them is their goal. Watermarking tries to hide a message related to the actual content of the digital signal, while in steganography the digital signal has no relation to the message, and it is merely used as a cover to hide its existence. Watermarking has been around for several centuries, in the form of watermarks found initially in plain paper and subsequently in paper bills. However, the field of digital watermarking was only developed during the last 15 years and it is now being used for many different applications. In the following sections I will present some of the most important applications of digital watermarking, explain some key properties that are desirable in a watermarking system, and give an overview of the most common models of watermarking as presented in the book by Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Friedrich and Ton Kalker [1]. These basic models will be further illustrated by the use of example watermarking systems that were developed in Matlab. All images used in this essay, except those used to present the results of the example watermarking systems are taken from this book .

Watermarking applications The increasing amount of research on watermarking over the past decade has been largely driven by its important applications in digital copyrights management and protection. One of the first applications for watermarking was broadcast monitoring. It is often crucially important that we are able to track when a specific video is being broadcast by a TV station. This is important to advertising agencies that want to ensure that their commercials are getting the air time they paid for. Watermarking can be used for this purpose. Information used to identify individual videos could be embedded in the videos themselves using watermarking, making broadcast monitoring easier. Another very important application is owner identification. Being able to identify the owner of a specific digital work of art, such as a video or image can be quite difficult. Nevertheless, it is a very important task, especially in cases related to copyright infringement. So, instead of including copyright notices with every image or song, we could use watermarking to embed the copyright in the image or the song itself. Transaction tracking is another interesting application of watermarking. In this case the watermark embedded in a digital work can be used to record one or more transactions taking place in the history of a copy of this work. For example, watermarking could be used to record the recipient of every legal copy of a movie by embedding a different watermark in each copy. If the movie is then leaked to the Internet, the movie producers could identify which recipient of the movie was the source of the leak

Finally, copy control is a very promising application for watermarking. In this application, watermarking can be used to prevent the illegal copying of songs, images of movies, by embedding a watermark in them that would instruct a watermarking-compatible DVD or CD writer to not write the song or movie because it is an illegal copy.

3. Watermarking properties

Every watermarking system has some very important desirable properties. Some of these properties are often conflicting and we are often forced to accept some tradeoffs between these properties depending on the application of the watermarking system. The first and perhaps most important property is effectiveness. This is the probability that the message in a watermarked image will be correctly detected. We ideally need this probability to be 1. Another important property is the image fidelity. Watermarking is a process that alters an original image to add a message to it, therefore it inevitably affects the image's quality. We want to keep this degradation of the image's quality to a minimum, so no obvious difference in the image's fidelity can be noticed. The third property is the payload size. Every watermarked work is used to carry a message. The size of this message is often important as many systems require a relatively big payload to be embedded in a cover work. There are of course applications that only need a single bit to be embedded. The false positive rate is also very important to watermarking systems. This is the number of digital works that are identified to have a watermark embedded when in fact they have no watermark embedded. This should be kept very low for watermarking systems. Lastly, robustness is crucial for most watermarking systems. There are many cases in which a watermarked work is altered during its lifetime, either by transmission over a lossy channel or several malicious attacks that try to remove the watermark or make it undetectable. A robust watermark should be able to withstand additive Gaussian noise, compression, printing and scanning, rotation, scaling, cropping and many other operations.

Watermarking models

There are several ways in which we can model a watermarking process. These can be broadly classified in one of two groups. The first group contains models which are based on a communication-based view of watermarking and the second group contains models based on a geometric view of watermarking. In the rest of this essay, I only refer to image watermarking because I only concentrated on images during the development of example watermarking systems.

4.1 Communication-based models

Communication-based models describe watermarking in a way very similar to the traditional models of communication systems. Watermarking is in fact a process of communicating a message from the watermarking embedder to the watermarking receiver. Therefore, it makes sense to use the models of secure communication to model this process.

In a general secure communication model we would have the sender on one side, which would encode a message using some kind of encoding key to prevent eavesdroppers to decode the message if the message was intercepted during transmission. Then the message would be transmitted on a communications channel, which would add some noise to the noise to the encoded message. The resulting noisy message would be received at the other end of the

transmission by the receiver, which would try to decode it using a decoding key, to get the original message back. This process can be seen in Figure 1.

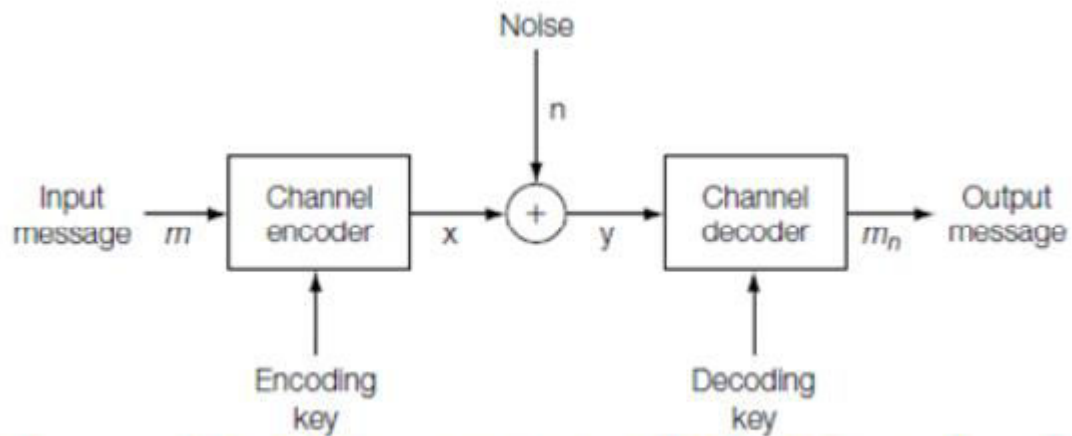


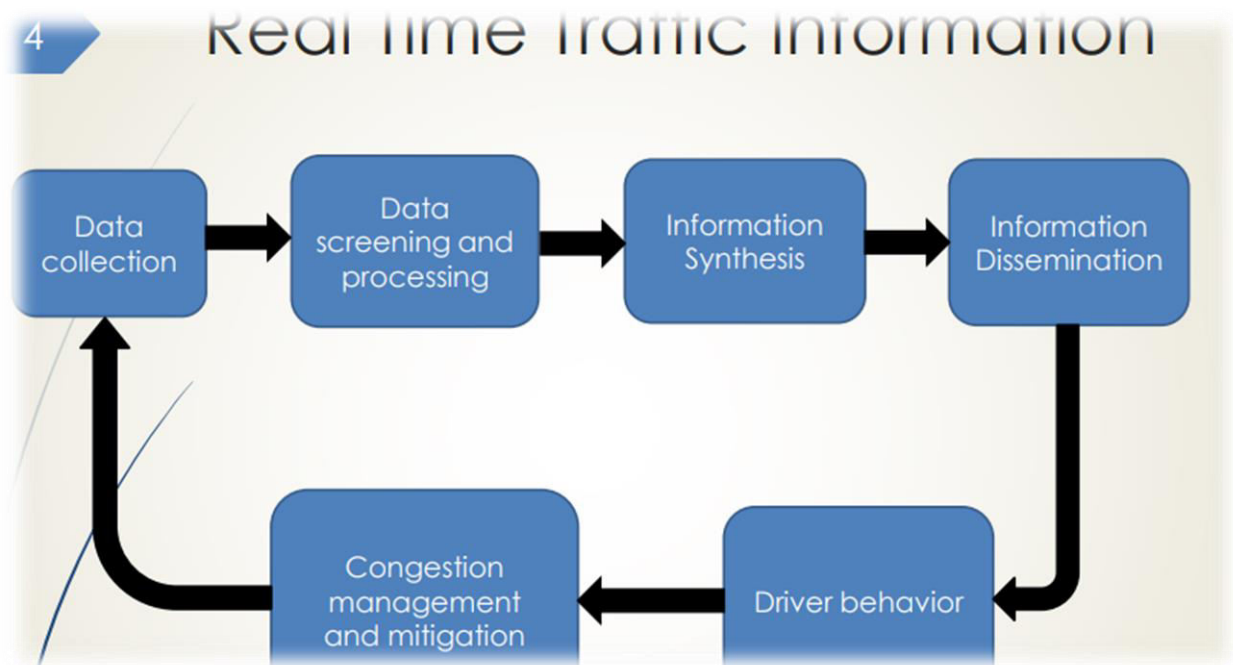
Figure 1 Standard model of a communications channel with key-based encoding

In general, communication-based watermarking models can be further divided into two sub-categories. The first uses side-information to enhance the process of watermarking and the second does not use side-information at all. The term sideinformation refers to any auxiliary information except the input message itself, that can be used to better encode or decode it. The best example of this is the image used to carry the message, which can be used to provide useful information to enhance the correct detection of the message at the receiver.

Case Study on Congestion (Real Time Driver Information for Congestion Management)

Problem Statement: Congestion mitigation via Driver's decision making process at pre-trip planning and en route. Conduct a literature review on past and current research efforts on data collection methods and technologies, data screening and information synthesis, information dissemination, impact on driver's behavior, and active traffic management strategies.

Solution:



Smart Lanes: Minnesota DOT

Dynamic lane use control, dynamic speed limits, queue warning and adaptive ramp metering strategies.

Green arrows indicate a lane is open.

Yellow arrows provide warnings to proceed with caution.

Red X signifies the lane is closed-drivers should begin to merge out of the closed lane.

30% reduction in collision and 22% increase in roadway capacity.

Smart Lanes. Real Time. Real Choices. Real Safe.

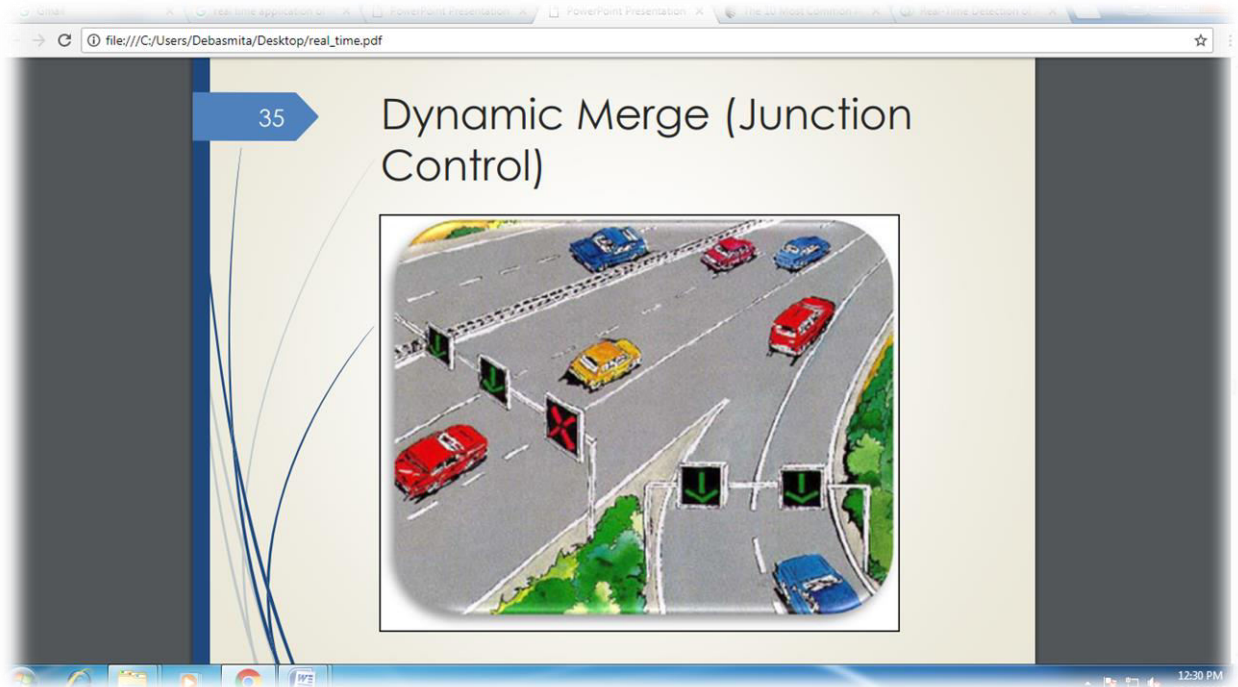


Impact of Real time information on drivers' behavior Drivers react to information in terms of route choice, trip time choice, travel speed, etc. One study showed that drivers receiving information with smartphones reacted to daily variation in travel times Another study showed the effectiveness of DMS in terms of speed reduction and crash rate reduction Some studies indicated that in-vehicle traffic information could be distracting due to information overload; other studies showed otherwise Several studies showed that real-time traffic information improves the overall performance of the road network.

ACTIVE TRAFFIC MANAGEMENT STRATEGIES Dynamic Lane Use (Shoulder Control) Dynamic opening of a shoulder lane to traffic or dynamic closure of travel lanes temporarily Ideal for congested and high transit volume freeways Shoulder running is based on traffic volume, travel speeds, incident presence Complementary ATM: variable speed limit, queue warning signs Benefits: Postponed onset of congestion× Increased capacity Improved trip reliability and travel times Challenges: Informing the public when shoulder running is allowed Possible bottlenecks at the end of the open shoulder segment

Dynamic Merge (Junction Control) Adjustment or closure of a lane or lanes upstream of an interchange. Ideal for congested freeway with high merging volumes Benefits: Delayed onset of congestion Increased capacity Improvement of traffic efficiency and reliability Challenges: Gaining public support Design and operations of the junction control area Data necessary:

Maximum capacity of upstream lanes, Traffic volumes on general purpose lanes and merging ramps, Travel speeds, Incident presence and location



Variable Speed Limits Changeable signs that reduce the speed limit in 5 mph increments downstream Ideal for congested freeways and areas prone to adverse weather Roadway or weather sensors are used with variable speed limits Benefits: Improved traffic flow Uniform traffic slowing or speed harmonization Few challenges with public support and operations of variable speed limits Enforcement issues Data required: Traffic volumes, Travel speeds, Local climate and weather conditions, Incident presence and location

Queue Warning and Dynamic Message Signs (DMS) Queue warning signs alert drivers of queues or backups downstream Loop detectors are used to help identify possible queues backing up Benefits: Reduced congestion Reduction of rear-end crashes and improved driver safety Challenges: Data quality and reliability Determining appropriate location for sensors Public awareness Operations and management Data required: Traffic volumes, Travel speeds, Travel times, Incident presence and locations.

Dynamic Route Guidance (DRG) Develops optimal real-time distribution of traffic Different algorithms are used according to congestion levels and real-time traffic conditions DMS or in-vehicle systems are used to inform drivers with recommended routes Data required: Congestion information, Travel times.

Case Study on Abstraction

Problem Statement: "*Abstraction* involves the facility to define objects that represent abstract "actors" that can perform work, report on and change their state, and "communicate" with other objects in the system."

Mapping with real world:

Let's imagine you own a Ferrari Car and you are the only one knows how to drive it in your family. One day a terrible breakdown happened to your car and you bring one mechanic to home and he checked it. But he is unable to repair it. So you contacted Ferrari company and some chief mechanic came to your home and repaired it(Since your car is under warranty, your pocket is still big :-))This is a real time example for the above mentioned OOP's concepts,

Before mentioning anything about abstraction, we can take three different users here (I am calling them as entity)

1) You 2) Local Mechanic 3) Expert

You Entity: Since you know only to start the car by pressing a button and all other operations behind the scene are abstracted from you.

Local Mechanic Entity: Our local mechanic knows some of the implementation of starting the car, i.e. he can open car's bonnet and check the battery cable or chock etc. So in short Local Mechanic Entity knows some of the implementations of the car.

Expert Entity: Since our expert (Designer of the car) mechanic knows all the operations of our car, he can repair it very quickly. So in short Expert Entity knows all the implementations of the car.

The car's operation is completely abstracted from you and it is partially implemented to Local Mechanic Entity and fully implemented to Expert Entity. So you are an abstract class having only abstract methods, Local Mechanic Entity has extended You(Since he is

also an ordinary user) and he implemented some of the methods and last our expert Entity extending Local Mechanic and implementing all the methods.

Also in terms of complexity "**Whenever abstraction decreases, complexity increases**"(Since our Expert Entity has very less abstraction, his complexity of work also increases)

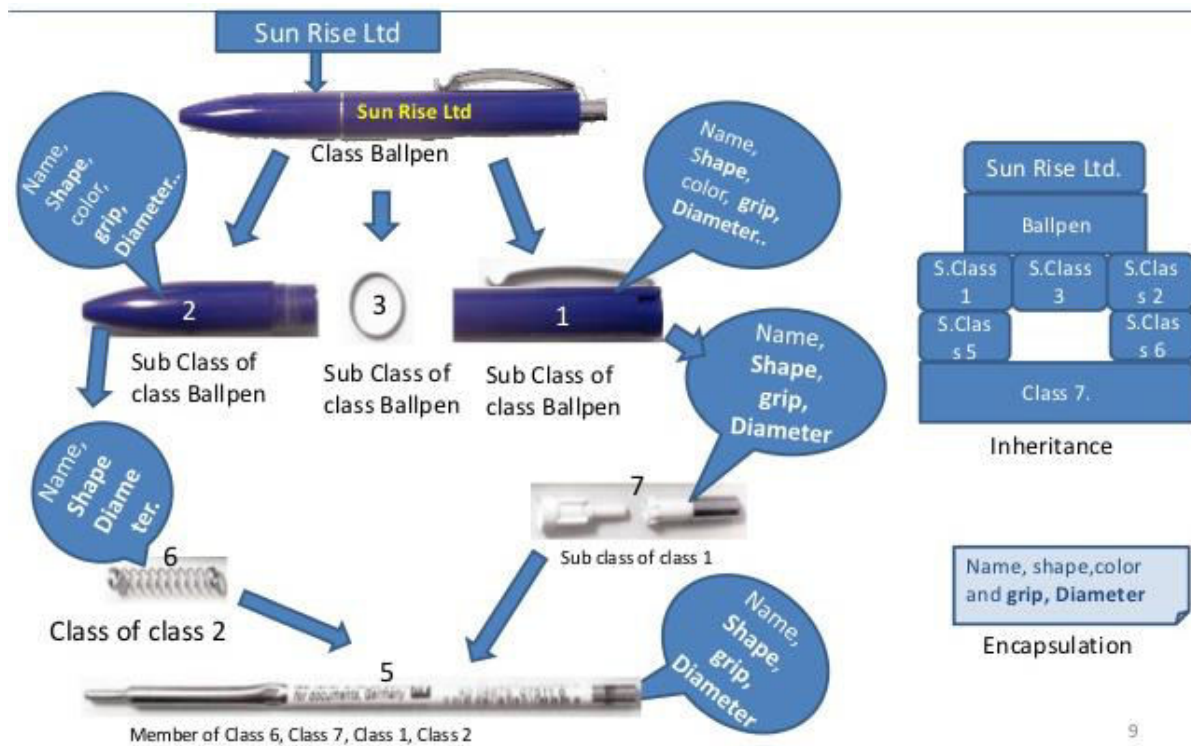
Case Study on Inheritance

Problem Statement: Means to inherit(adopt) the feature/functionality of base class and also add their own functionality.

Mapping with real world:

The process of eqiring the existing functionality of parent and with new added features and functionality of a child Object.

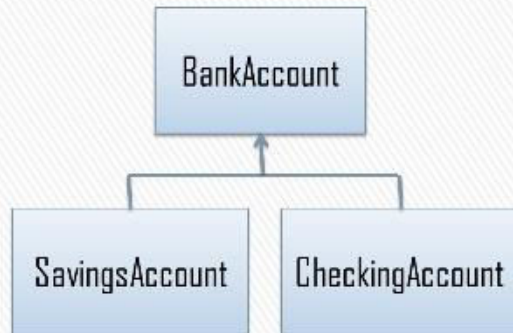
EXMPLE- a child inherit(adopt) some features of their parents & also add some features of their own.



From the above diagram we already understand that some of the properties remain same in the modified version of the pen. But the name and outlook of the class are different.

BankAccount Inheritance Example

- » **Savings Account** is a bank account with interest
- » **Checking Account** is a bank account with transaction fees



From the above diagram we already understand that some of the properties remain same in the classified version of the bank account. But they are ultimately belong to the same persons bank Account.



From the above diagram we already understand that some of the habits remain same in the next generation of any person.

Case Study on Polymorphism

Problem Statement: you can say that a object (person,place or thing) acts differently in different situations.

Mapping with real world:

An Object is in different forms and in each form its exhibit the same functionality but the implementation is different.

Eg: A Person who knows more than two languages he can speak in a language which he knows. Here person is Object and speak is polymorphisam.

POLYMORPHISM-

poly means "MANY" ,

morphism means "FORMS"..

MEANS many forms

or u can say that a object(person,place or thing) acts differently in different situations

example-

if a girl is married and mother of twins children doing teaching job den she is a women first .

Teacher in a school when she is in school,,wife of someone at home.

Mother of her children.

And obvious daughter of someone

Means a woman plays diffent roles at different times dats the polymorphism (many forms).

Polymorphism: It looks(by the name in programming) like same but expresses different characters. These twin brothers looks alike but they hold different characters.



Case study of session

Problem Statement: Every cycle has a limited time optimization.

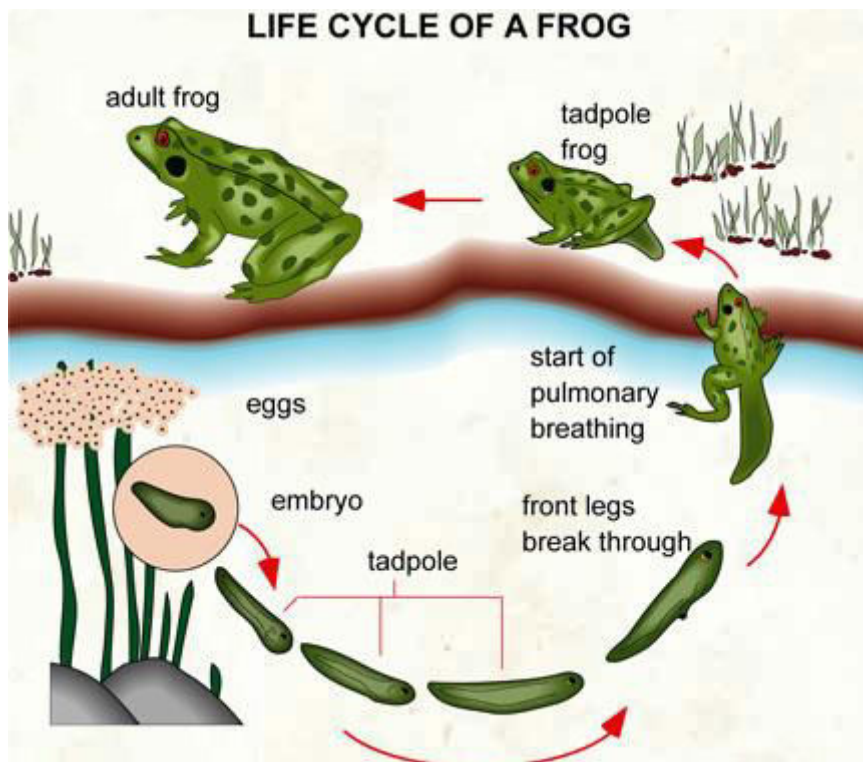
Mapping with real world:

A session is a conversation between the server and a client. A conversation consists series of continuous request and response.

When there is a series of continuous request and response from a same client to a server, the server cannot identify from which client it is getting requests. Because HTTP is a stateless protocol.

When there is a need to maintain the conversational state, session tracking is needed. For example, in a shopping cart application a client keeps on adding items into his cart using multiple requests. When every request is made, the server should identify in which client's cart the item is to be added. So in this scenario, there is a certain need for session tracking.

Solution is, when a client makes a request it should introduce itself by providing unique identifier every time. There are five different methods to achieve this.



It has fundamental information about what a session is and how to manage it. At the end of that article I have given a preview about "5. Session tracking API".

Now we are going to dive deep into it.

Just to recap, session is a conversation between a server and a client. An elite way to manage the session in servlets is to use API. Any web server supporting servlets will eventually have to implement the servlet API. It may or may not provide with more features of luxury but the minimum is guaranteed. Servlet specification ensures that, the minimum features provided make the session management job easier. Servlet API will use one of the underlying traditional mechanisms like cookies, URL rewriting, but that will happen behind the scenes and you need not worry about it!

Every request is associated with an HttpSession object. It can be retrieved using getSession(boolean create) available in HttpServletRequest. It returns the current HttpSession associated with this request or, if there is no current session and create is true, and then returns a new session. A session can be uniquely identified using a unique identifier assigned to this session, which is called session id. getId() gives you the session id as String.

isNew() will be handy in quite a lot of situations. It returns true if the client does not know about the session or if the client chooses not to join the session. getCreationTime() returns the time when this session was created. getLastAccessedTime() returns the last time the client sent a request associated with this session.

Case Study on Encapsulation

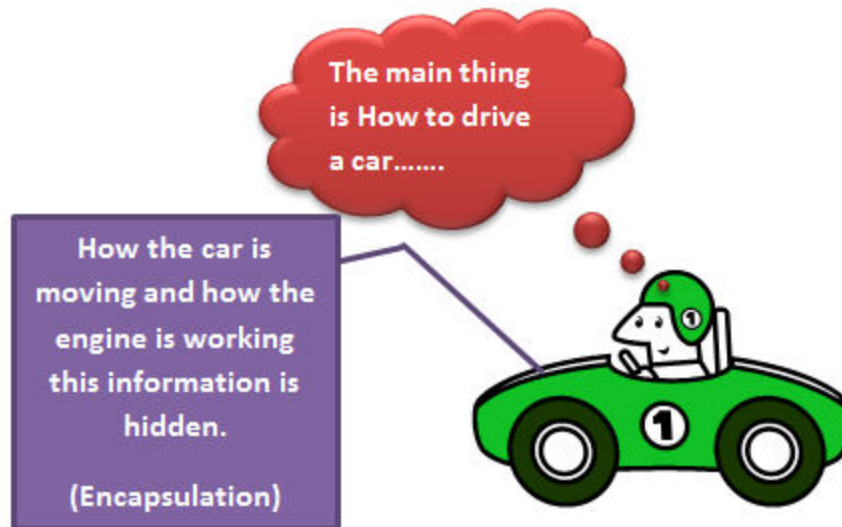
Problem Statement: "Encapsulation is to hide the variables or something inside a class, preventing unauthorized parties to use. So the public methods like getter and setter access it and the other classes call these methods for accessing".

Mapping with real world:

Let's imagine you own a Ferrari Car and you are the only one who knows how to drive it in your family. One day a terrible breakdown happened to your car and you bring one mechanic to home and he checked it. But he is unable to repair it. So you contacted Ferrari company and some chief mechanic came to your home and repaired it (Since your car is under warranty, your pocket is still big :-)) This is a real time example for the above mentioned OOP's concepts, How?

Encapsulation:

As a driver you know how to start the car by pressing the start button and internal details of the starting operations are hidden from you. So the entire starting process is hidden from you otherwise we can tell starting operation is encapsulated from you.



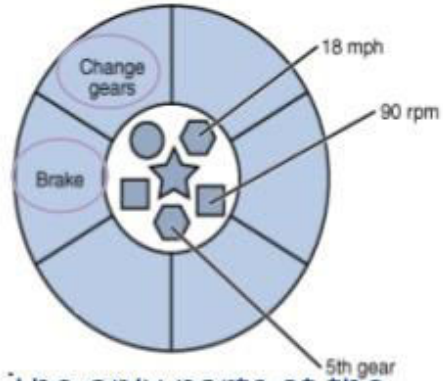
OR

Encapsulation

Some pictorial examples



- Internal mechanics of changing gears are (private) hidden from us: all we need to do is to use the public interface/panel (the gear rod) provided to us when we want to change gears.



- The only parts of the above object that are accessible to other objects would be the ones marked in red.

The driving wheel is encapsulated the process of rotating the wheel from you.

Case Studies of The Transformers Failure Analyses

India's manufacturing sector, heavy industries, various global service centres are all dependent on reliable power supply. This underlines the principle that 'No Power-No Business'. This makes it utmost important that 'Transformers', the heart of substation, must function reliably. Failures of critical transformer-assets not only impact industries but other consumer categories also affect the economy of the country and have social and political ramifications.

We'll study the transformers, which come for repairs after failure in the industry and analyse the various causes of failure of power transformer and distribution transformer in detail. By knowing the causes of failure, we can take steps to overcome it and thus reduce the fault occurrence in transformers and make the power supply more reliable. A transformer is a vital equipment that connects the generation to various types of loads. The right kind of design, manufacture, test, operation and protection increase normal life of transformer.

All power utilities are much worried these days due to high rate of failure of distribution transformers and service. The failure rate of transformers in India is in the order of 12 to 15% as against less than 1% in developed countries. No one wants to share responsibility of failure. Manufacturers often blame the users for running the transformers in overload for single phasing or unbalancing. Users are of the opinion that the cause of failure is due to faulty design or bad materials or poor workmanship. But the fact is – responsibility should be shared equally by both.

The manufacturer should accept the feedback from the utilities without any prejudice – and take remedial measures, while the users, on their part, should ensure that the equipment is not abused, and correct feedback on the product's performance is passed to the manufacturer.

Collection of failure data is the first major task. In free repair service or in repair contract, very little effort is made by utilities to find out the root cause of failure, which could be one of the reasons why a damaged transformer is replaced by a new one without removing the cause of damage, leading to failure immediately or within a very short period.

Company details

The projects has been done at Royal Electricals Pvt. Ltd. plot no 1405, phase 5, GIDC Estate, Vithal Udhyognagar 388121, Dist. Anand, Under the IDP Scheme Gujarat Technological University.

Classification of failures of a transformer

For the purpose of discussion, we have divided faults into three classes:

Failure attributed by users

- Prolonged over loading
- Single phase loading
- Un-balanced loading
- Faulty terminations
- Power theft by hooking
- Faulty earth connection to tank body as well as LV terminal
- Failures due to external short-circuit
- Less maintenance
- Improper installation

Failure causes at the manufacturer's end

- Faulty design
- Poor quality of material
- Bad workmanship
- Improper transportation
- Sharp edges of conductor
- Incomplete drying
- Bad insulation covering on conductor
- Improper joints or connection

Failure during working condition

- Deterioration of oil
- Faults in magnetic circuit
- Inadequate pre shrinkage of the winding
- Inter turn faults

Major failures in power transformers

- Oil leakage
- Deterioration of oil
- Ventilation failure
- Loose clamping
- Bushing flashover
- Fault in OLTC
- Inter-turn fault

Case studies

Failure due to bad insulation of conductor

Various types of insulation are used as coverings of conductors. The type of covering depends upon the type of use and basic insulation of the transformer. It is very common to see a conductor with lost wrapping. Also, the conductors have single covering instead of double covering. The quality of paper is also one of the causes of failure.

The workmen should be properly trained for proper insulation of winding – and identify bad material of insulation during the process of coil making.



Fig. 1: Winding insulating process...

Improper joints or connections

The local heating generated by improper joints or connections may slowly lead to a deterioration of the oil – if the joints are oil immersed. The oil temperature indicator and/or winding temperature indicator (both with alarm contacts) can be used to insulate such problems. Gas operated relay, can also be used to sound an alarm – and actuate the trip circuit if the condition calls for it.

Case study: (improper joints or connections)

11kV/415V, distribution transformer: in distribution transformer, the linemen sometimes make improper terminal connection. This results in to overheating of transformer near the joints, resulting in to failure.



Fig. 2: Improper joint...

Deterioration of the insulating oil

The insulating oil deteriorates gradually with use. The main cause is the absorption of the moisture in the oil. Each time the moisture is doubled in a transformer, the life of the insulation is cut by one-half. Failures due to moisture are the most common causes of transformer failures.

Reasons for moisture influx

- Moisture can be in the insulation when it is delivered from the factory. If the transformer is opened for inspection, the insulation can absorb moisture from the atmosphere
- If there is a leak, moisture can enter in the form of water or humidity in air. Small oil leaks, especially in the oil cooling piping, will also allow moisture ingress
- Moisture is also formed by the degradation of insulation as the transformer ages
- Most water penetration is flow of wet air through poor gasket seals due to pressure difference caused by transformer cooling. The most common moisture ingress points are gaskets between bushing bottoms and the transformer top and the pressure relief device gasket
- If in breather the moist silica is not replaced by dry silica gel. Then moisture can enter from atmosphere.

Effect of moisture

Paper insulation has a much greater affinity for water than does the oil. The water will distribute itself unequally, with much more water being in the paper than in the oil. The paper will partially dry the oil by absorbing water out of the oil. Moisture and oxygen cause the paper insulation to decay much faster than normal.

Due to moisture oxidation takes place. Oxidation results in the formation of acids in the insulating oil, which in turn, contributes to the formation of sludge.

The rate of oxidation also depends on the temperature of the oil; the higher the temperature, faster is the oxidative breakdown. Sludge settles on windings and inside the structure, causing transformer cooling to be less efficient, and slowly over time temperature rises.

Acids cause an increase in the rate of decay, which forms more acid, sludge, and moisture at a faster rate. This is a vicious cycle of increasing speed forming more acid and causing more decay.

Case study : (Deterioration of the insulating oil)

Moisture content in the oil increases, and when the transformer is energized, water begins to migrate to the coolest part of the transformer and the site of the greatest electrical stress. This location is normally the insulation in the lower one-third of the winding. Paper insulation has a much greater affinity for water than does the oil. The water will distribute itself unequally, with much more water being in the paper than in the oil. The paper will partially dry the oil by absorbing water out of the oil. Temperature is also a big factor in how the water distributes itself between the oil and paper.

There is almost twice the moisture near bottom as there is at the top. So, this transformer failed in the lower one-third of the windings due to paper insulation breakdown.

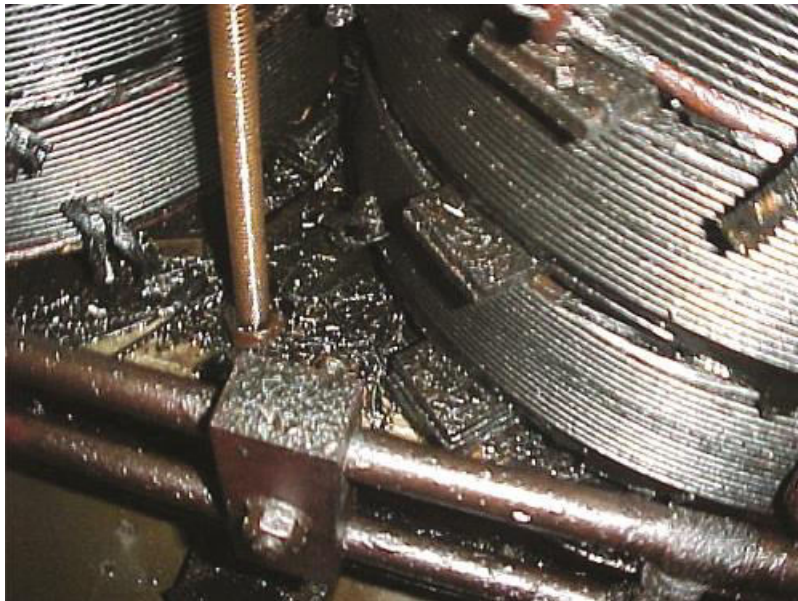


Fig. 3: Failure due to moisture content in oil...

Case study : (Inter turn fault)

50 KVA, 11kV/440 V

Cause of failure

Failure of transformer took place due to shorting of few turns of winding of the same phase. This was due to overloading of transformer, which results into insulation failure due to overheating.



Fig. 4: Interturn faults...

Case study: (Fault in magnetic circuit)

Rating: 11kV/440V, 30 KVA

Cause of failure

Insulation between lamination got damaged, which resulted into local overheating and due to which many laminations got short circuited. Thus, winding temperature got increases and its insulation failed.



Fig. 5: Core insulation failure...

Inadequate pre shrinkage of the winding

Insulating paper blocks used for horizontal and vertical supports of coil are bound to shrink during service due to generation of heat. This shrinkage is more in case of disk coil. Shrinkage may cause looseness in coil assembly, which may result in failure due to short circuit forces.

To overcome such failure, it is recommended that good quality of insulating bolt must be used. After heating coils to the required level, coils are compressed judiciously by a skilled workman till it reaches the required shrunk height.

Case study :(Inadequate pre shrinkage of the winding)

Rating:11KV/440V,40 KVA

Cause of failure

As shown in the figure (below), due to shrinkage of paper blocks, the coil got loose. During external short circuit fault, failure of the transformer occurred due to movement of discs.



Fig.6: Failure due to paper block shrinkage...

Oil leakage

Oil in addition to serving as insulating means serves to transfer the heat generated in the windings and the core toward the walls of the tank and the radiators. Due to this it has:

- High dielectric breakdown
- Low viscosity

If the oil leaks from the transformer tank due to some reason, the oil level in the tank will drop. In the worst case, the connections to bushings and parts of the winding will get exposed to air. This will increase the temperature of the windings. This in turn, would damage the insulation of the winding. Apart from this moisture can get in through the leak, and degrade the transformer oil – leading to an overheated transformer.

In power transformer, the conservator tank is provided with an oil level indicator having an alarm facility. If the oil level drops below a predetermined level, the alarm will ring. It allows the operator to initiate necessary actions.

But in distribution transformer, oil level indicator with alarm facility is not provided. Only a small transparent window (gauge) placed conservator tank to see the oil level is provided. It shows the level of the oil directly, being able to see from the outside. When the crystal is dirty, you can wipe it off with a rag. Periodic checking of this window is not done in India. So, many of small transformers fail due to decrease in oil level.



Fig. 7: Oil level window...

Causes of oil leakage

Oil leaks can occur from many parts of transformer tank: Radiator fins, Bad welds, Cracked voltage bushings, Gaskets, Butterfly valves controlling the flow of oil between the radiator and main oil tank.

Oil leaks in gaskets

Oil leaks from transformer gasket, if it has aged, lost elasticity and cracked as it cooled much further than its normal operating range. This is often a slow weeping rather than a catastrophic failure; however, over a time, the weeping can cause a serious amount of oil loss.

It is better to use the gasket without a joint, but it is not possible as the gasket is too large. There are round, square, rectangular and oval-shaped gaskets, but in any case try to join the gaskets by using a flat portion of the gasket. If this is not done, then there are more chances of gasket failure. If the element (or a component to seal that) adopted for the gasket, is not of thin layer or not dried with air – than the oil can leak through the gasket.

Many times even after correct adjustment, the gasket oil leak is not stopped, then the gasket will have to be replaced with a new one. A gasket with low elasticity such as lead type must always be changed with a new. Do not use the old one again.



Fig. 8: Gaskets...

Oil leakage from radiator

Radiator fins are a common area for oil leaks. Fins are made from thin metal to aid heat transfer. The downside of that thinness is that internal corrosion due to water ingress and separation or external environmental corrosion can quickly penetrate and spill the oil.

This leakage must be repaired by welding, to make sure that the heat from the welding is not going to produce an explosive gas mixture.

(There is no need to take any cautionary steps in the case of nonflammable oil).



Fig. 9: Oil leakage from radiator...

Conclusion

From case studies of Royal Transformers Pvt. Ltd. on transformers, we conclude that major failures that occur are mainly on distribution transformer of rating 11kV/433V. The major causes of failure on this range of transformers are unbalanced loading, single phasing, overloading and some user attributed reasons. The major failures on power transformers are due to insulation damage, deterioration of oil, leakage of oil and also due to bushing failures.

14,000 Volt Electrical Injury to Bilateral Upper Extremities: A Case Report

Electrical burns are among the most devastating of burn injuries. High voltage electrical injuries result in extensive deep tissue damage and are associated with multiple complications, long term morbidity, and a high mortality rate. We describe the case of a 47 year-old electric company linesman who suffered a high voltage electrical injury (HVEI) of 14,000 volts to bilateral hands and wrists managed by the Division of Plastic and Reconstructive Surgery at the McGill University Health Center in Montreal, Quebec, Canada. His management included multiple operative procedures, including escharotomies, fasciotomies, serial debridements, and bilateral pedicle groin flaps, and amputation of his left hand.

Electricity is omnipresent in our daily lives. Unfortunately, electrical injury can result in some of the most devastating thermal traumas. As opposed to thermal burns, the cutaneous burn size does not correlate with the extent of damage seen in highvoltage (>1000 V) electrical injuries; electrical injuries result in extensive deep tissue injury in addition to various other systemic complications. Morbidities, prolonged hospital stay, multiple visits to the operating room, and long rehabilitation process are not uncommon with these types of injuries.

CASE STUDY

A 47 year-old Caucasian male, working as an electric company linesman, was transferred to the Montreal General Hospital following a workrelated high-voltage electrical injury (HVEI). While working near high tension power lines, he lost balance and accidentally grabbed hold of a wire running 14,000 V with both hands. He was subsequently thrown from the source, fell approximately twenty feet, and suffered blunt head trauma resulting in loss of consciousness.

On arrival to hospital, the patient was alert, oriented and hemodynamically stable. He had 3% visible total body surface area burns involving bilateral wrists

circumferentially and bilateral hands ([Fig. 1](#)). This consisted of third degree burns to the volar aspects of both wrists, and second degree burns to the dorsal aspects of both wrists and hands with digits and palms relatively spared. CT scan of the head revealed a left frontal bone comminuted fracture and a left subdural hematoma with a 3mm shift. The patient was immediately taken to the operating room by the neurosurgery team for left frontal craniectomy. In addition, he presented with myoglobinuria and a creatine kinase of 32 000 U/L and thus copious intravenous hydration was begun.

Figure 1



Images on day of admission taken in the operating room. Images A & B show the volar aspects of the left and right wrists, respectively. Images C & D show the burns extending onto the dorsal surface of the left and right hand, respectively. ...

Within hours of presentation, he was found to have elevated compartment pressures in both hand (100 and 70 mmHg on the right and left, respectively) and wrists (91 and 75 mmHg on the right and left, respectively) and was immediately taken to the operating room for bilateral hand and wrist escharotomies and fasciotomies ([Fig. 2](#)). Subsequently the patient was taken back to the operating room for serial debridements

of necrotic tissue. MRI with gadolinium was performed to delineate the extent of deep tissue injury. Imaging had shown extensive tissue necrosis extending from the distal third of the forearm to the level of the wrists bilaterally, involving both extensor and flexor compartments ([Fig. 3](#)).

Figure 2



Post-fasciotomy images of the patient in the operating room. Images A & B showing wrist fasciotomy, thenar incisions, and carpal tunnel release of left and right hands and wrists, respectively. Images C & D show fasciotomy incisions on ...

Figure 3



MRI with gadolinium of left wrist and forearm. The image of left forearm demonstrates the extensive non-enhancing muscles from the distal third of the forearm to the level of the wrist suspicious for myonecrosis involving both extensor and flexor muscles. ...

Despite escharotomies, fasciotomies and serial debridements the patient's left hand became progressively congested with poor doppler signals and low O₂ saturation within each digit. On postburn day 16, 9 days since the last debridement, the hand became cold and did not return blood on pinprick in any of the digits. Later that night, the patient was taken to the operating room for amputation of the left hand. After

amputation, the patient was left with significant soft tissue defects to bilateral wrists and hands.

Pre and post separation of pedicle groin flap to bilateral wrists. Image A shows the patient with bilateral pedicle groin flaps attached to bilateral wrists. Image B shows the amputated left hand once flap was separated and inset. Image C shows the right ...

In summary, the patient remained in hospital for a total of 81 days, 65 of which were spent in the ICU. He was taken to the operating room a total of 7 times for escharotomies, fasciotomies, and serial debridements of bilateral hands and wrists, as well as amputation of his left hand and the necessity of tissue transfers, in the form of pedicle groin flaps, for soft tissue coverage. His course was complicated by rhabdomyolysis with a creatine kinase level peaking at 52 235 U/L, which was successfully managed with copious intravenous hydration and diuresis. The patient is currently rehabilitation center, working extensively with physiotherapy for elbow and shoulder mobility. Future plans include extensive tendon transfers to the right hand for improved function.

DISCUSSION

It is reported that electrical burns constitute between 0.04% to as high as 32.2% of admissions to major burn centers (1, 3-6). Mortality rates are significant with these types of injuries, reported in the literature to be as high as 59% (1); the most common cause being secondary to an acute arrhythmia at the scene of the injury(2). They account for approximately 1000 deaths each year in the United States alone, ranking 5th as the most common cause of occupational deaths (3). Electrical burns are most commonly seen in work related injuries and involve mainly young males. Electrical company linesman, electricians and construction workers are especially at risk (4, 5). Sadly, it has been reported that as little as 5.4% of patients suffering a HVEI are able to return to their previous line of work (2). This can likely be attributed to the fact that these injuries commonly involve the hands and upper extremity (4, 5).

Contrary to thermal burns, high-voltage injuries result in extensive deep tissue damage, extending far beyond what can be predicted by TBSA involved, and resulting in higher rate of complications (6). In a case-matched controlled analysis comparing HVEI and thermal burns, Handschin et al. (6) found a significantly higher rate of escharotomy/ fasciotomy (47% vs. 21%), amputations (19.1% vs. 1.5%), as well as total hospital length of stay (44 days vs. 31 days) in HVEI versus thermal burns.

Commonly seen with HVEI are associated acute injuries which include fractures, head trauma, intra-abdominal injury, renal injury, soft-tissue injury, and acute ocular injury.

Associated injuries have been described to occur in 25.1% of HVEI (5, 8). In addition to associated trauma, patients suffering HVEI are prone to various complications as well. In a study involving 202 electrical injuries, neurologic complications, deep muscle involvement, and amputation of extremities were found to be the most prevalent (4). Similarly, Arnoldo et al. found amputation of extremities or digits and muscle necrosis to be some of the most frequently observed complications, observed in 95 and 68 of the 263 cases of HVEI, respectively (5). As presented in our case, myoglobinuria and fasciotomy are also commonly encountered complications. In the current literature, escharotomy/fasciotomy rates have been described to be as high as 54% (7) and amputation rates as high as 49.4% (2).

Interestingly, Cancio et al. found myoglobinuria to be a factor associated with the need for fasciotomy. Furthermore, they had found myoglobinuria and the need for fasciotomy to be independent risk factors for amputation. Using an equation derived to predict the probability of amputation (8), the patient from our case had a 94.98% probability of requiring an amputation.

HVEI are devastating injuries associated with a vast array of serious and inevitable complications. The prognosis for these patients depends on the degree of the initial insult as well as the severity of any subsequent complications. Early intervention is the goal with resuscitation and aggressive surgery being the mainstay of management. Considering that most HVEI are work-related, the best way to decrease the morbidity and mortality related to these injuries is prevention. Through public education and work safety programs, most electrical injuries can be avoided.

High voltage is a source of interest to both the engineer and to the layman. Interest ranges from the sight of speeding electrified commuter trains to horrible accidents when humans contact high voltage. In this article we cite 4 cases of high voltage accidents. Each accident teaches something different about electricity and electric safety. Let us first begin with some clarifications. By formal definition, high voltage is defined as any voltage above 600 volts. Below 600 volts, one should consult the NEC (National Electric Code) for the rules of electrical installation and safety. Above 600 volts, the better safety code is written by OSHA (Osha). This should not in any way diminish the danger of low voltage circuits. People die in their homes every day from electrocution caused by 120 and 220 volt sources. Statistically, high voltage deaths are only about 1/3 of the total electrocutions surveyed each year. Furthermore, we have personal experience of visiting factories and other sites where electricity is introduced in to an area that is frequented by many people; often these sites have prominent warning signs: HIGH VOLTAGE, even if the level is merely 220 volts. As a key to understanding High Voltage, we must consider the human being as a resistor. Adults can be modeled successfully as a 500 ohm resistor; this represents the core of the adult and ignores the skin resistance. The core value is determined by blood, bone, and tissue and not the skin surface, which can be as little as a few ohms or many hundreds of thousands of ohms. The resistance of dry skin is generally 1000 to 100,000 ohms, but for voltages of 300 or larger, the skin is considered breached by the electric current after only one second, and the flow of current is only impeded by the 500 ohm internal resistance. The phenomenon of arcing or flashover must also be considered. In this case, electricity leaves its source and travels through the air to connect with the human. It should be noted that the insulating properties of air are extremely good. The breakdown of air (even if the air is saturated with moisture) is at least twice what it is for glass. In other words, an "air" shield protects you better than a glass one. See . But for arcing to be considered and avoided, even this may not be good enough to protect in all cases. A better insulator is Sulfur hexafluoride. The fluorine atom has a valence of -1, i.e. it is not stable until it can capture one electron in to its outer shell. Furthermore, Fluorine is the most violent reactor of all of the Halogens (i.e. elements with valence -1). Sulfur has 6 electrons in its outer shell. Normally, Sulfur reacts to capture 2 electrons to stabilize in to a compound. For example, CdS or Cu₂S are examples of semiconductors where the Sulfur has captured two electrons from the cadmium or copper and thus formed a stable compound via valence bonding. With SF₆, the reaction expected is "backwards". The Sulfur is stripped of all 6 of its outer electrons. The violent reacting Fluorine is subdued and remains quiet and stable. In fact the compound is so stable that it is better than air and is used as the insulating material in many very high voltage applications, including the construction of capacitors used in Hi-Pot-testing. The dielectric breakdown is nominally 30 times greater than that of dry air . Hi-Pot is another term familiar to the High Voltage engineer. Hi-Pot or hipot is an abbreviation for high potential or high voltage testing. Suppose you have a circuit breaker to be used to break the circuit in a 250,000 volt line. This might be tested with DC at a few Pico-amps but up to 300,000 or even 500,000 volts. Often the rule-of-2 applies where

possible. The rule-of-2 says that if any device (circuit breaker, capacitor, meter, inductor, etc.) is to be operated safely and without breakdown at a voltage X , then it should be stressed, under test, up to AT LEAST a voltage $2X$ (or even as high as $4X$ according to some engineers). The rule of 2 is NOT an official scientific principle like Ohm's Law. Rather, design engineers often use $2X$ as the test to prove the reliability of a product under a stress X . A quick check of the internet under the topic "reliability" verifies the rule of 2 (and the rule of 3 and even the rule of 4). In electronics design and particularly in the design of power electronics, the test stress is more likely $2X$. See for instance the electronics books [6] and [13]; see also, the spec sheets for various Fluke multimeters, which are pertinent to Case #3 discussed in this paper; these show a maximum voltage for most meters of 1000 and an overvoltage of an additional 1000 volts. Back-emf (or back-electromotive force) refers to a voltage generated "backwards" from the direction that the processing normally proceeds in. This often involves a motor or other mechanical moving object that can act as a generator. In the forward direction, electricity converts to mechanical motion or mechanical work. In the backward direction, a voltage is fed from the motor back into the power source. Throughout the rest of this article, we will be talking about real-life cases analyzed by us. To protect a person's right to anonymity, we will not give the real identity of any of the people and companies discussed.

Case #1: A Circuit breaker at a substation must be able to stand a stress of 250,000 volts

We start our analysis at the highest voltage normally available to most power engineers. In New York State, a power company is testing a new circuit breaker. The breaker must be able to interrupt power to 3-phase electricity with an RMS value of 250,000 volts. Hence the breaker is 3 breakers operating in parallel. Part of the breaker is a "snubber" circuit (An electronic sub-circuit used to regulate very high voltage and current changes in a circuit). Recall that we are dealing with 3 states here: the "off" or zero-voltage state, the "on" or 250,000-volts state, and the intermediate or transitional state. It is the intermediate state that is most dangerous. If you build a 5 volt logic circuit in the lab and leave it on at 5 volts, the circuit is relatively free of being damaged. If you turn it on and off rapidly, you can produce spikes of 10 volts or more, and this can act to destroy the circuit board. With High Voltage, the danger is much greater. If there is a spike to 500,000 volts or several million volts, the electricity can jump the ceramic insulators and travel up to 30 feet in air to electrocute someone. Therefore, a snubber is an ideal and mandatory safety feature of the circuit breaker. In the course of the testing procedure, several "barrel" transformers were charged (along with parallel capacitors) to about 25,000 volts apiece. These were then switched in to a "series" configuration generating the requisite 500,000 volt test voltage. Current was no larger than a pico-amp. A company technician was in a lift bucket when a "basketball" of light flew through the air and hit him and left him for dead. He suffered burns and muscle and organ damage as a result. He did not die, but he experienced body tremors (the "shakes") for several years after the accident. He also suffered post-traumatic stress disorder. The effects on a human of a high voltage shock from arcing are discussed. This worker's

accident was the second such accident to occur in a 2 year time period when testing this particular circuit breaker. What problem in the circuit breaker was the cause of these 2 accidents? The circuit breaker was originally built with a single capacitor in parallel with the remaining components of the breaker. The value of the capacitor was 2 nF. This capacitor was expected to be stressed up to 500,000 volts without breakdown of the insulator. A new design engineer later revised the circuit to employ two capacitors in series. This new series arrangement was put in parallel with the remainder of the breaker. Each capacitor was only to be stressed to 250,000 volts. Each capacitor had twice the surface area of the original capacitor they replaced. Hence, each had a value of 4 nF, and their series combination was 2nF, the same as the original capacitor. Since the voltage stress on each was to be 250,000 instead of 500,000 as it had been for the original capacitor, the need to spend money to make the capacitors “rugged” to voltage stress was reduced. The money spent on building a capacitor to operate safely at a voltage will increase by 4 each time you double the maximum voltage stress of the capacitor, since construction costs are proportional to storage capacity (energy) and this in turn is proportional to the voltage squared. Consequently, there is a big savings in decreasing the voltage stress on a capacitor. During the testing, “barrel” transformers are used to transform ordinary electricity (single phase 120 volts) to 25,000 volts per phase. These are then put in series and rectified to the DC value of voltage up to 500,000 volts. Before the circuit breaker was stressed, the capacitors were first stressed. Since the line is 3-phase, each phase was stressed to 500,000 volts. In the ideal case, two capacitors in series split the voltage evenly. But two capacitors in series is a very “bad” architecture. If two equal resistors are put in series, the voltage in the middle is always half the applied voltage, or if you include experimental error, the voltage in the middle is half the applied voltage plus/minus a small percent. Capacitors can be thought of as infinite ohm resistors. In actual fact, the resistance is many billions of ohms and not infinite. If it were possible to construct each half of the capacitor at exactly 4 nF and if it were possible to maintain the shunt resistance of each capacitor at exactly the same value, then this accident would not have happened – initially the voltage of the high-end plate is 500,000 and the voltage of the middle plate between each capacitor is exactly 250,000. After the high-end plate is discharged to ground, the voltage of the middle plate automatically goes to zero. This can be proven by simple calculations. See, also the Appendix at the end of this paper. If, however, the capacitors are mismatched or if the shunt resistance of each capacitor is slightly different for each capacitor, then a residual voltage resides on the middle plate after the top plate is discharged. The middle plate between the capacitors must be discharged or a voltage of several thousand volts can exist. If we assume a 1% mismatch in the capacitors involved in this accident, then this voltage is 5000 volts, but whatever its exact value, it will be in the range of one or more kilovolts, based on similar arcing incidents at other substations. Indeed, this was the cause of the 2 accidents cited here. We show in our Appendix that a mismatch of 1% in resistance and capacitance will result in a voltage of 1% of 500,000 (i.e. 5000 volts) on the middle plate, even after discharging the top and bottom plates. In this accident, a company worker was in a lift bucket above ground. He was approximately 10 feet from the capacitor. The capacitor for phase #1 was tested up to 500,000

volts DC. It was gradually brought down. A grounding stick was placed on the high voltage end of the capacitor, while the low voltage end was at ground. But NO protocol was followed for the center point (i.e. for the point between the two caps in series). Nothing happened.

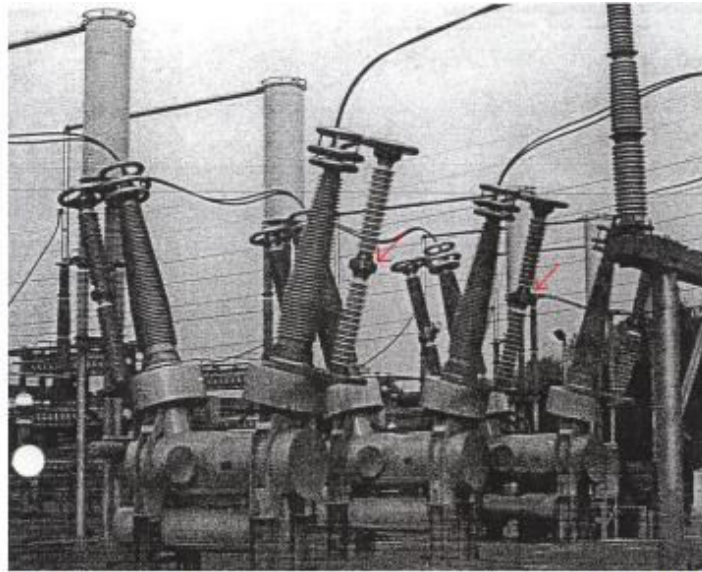


Figure 1. 3-phase circuit breaker, 250,000 Volts. Note – Capacitor that caused accident labeled with the arrow on the right. Accident occurred for the hipot test of the second phase. No accident occurred from testing the first phase (left arrow). The third phase (no arrow indicated) was not tested, since the accident precluded this.

By luck, the capacitor mismatch was small enough that the extra voltage at the middle plate was low, i.e. low enough so that it did NOT cause any trouble. We estimate that the mismatch was 0.1% or less – see the Appendix. The Hi-pot test continued for the #2 phase of the circuit breaker's capacitor. After 500,000 volts was reached, a grounding stick was placed on the high end. The middle point again was not involved. Suddenly, from the middle point a ball of light the size of a basket ball emerged. It struck the employee. He did not die. But he required emergency care, and his burns and muscle spasms lasted for many years, precluding him from the work for which he was trained.

Analysis of this case:

IN THEORY, the voltage at the middle point between two equal capacitors in series is zero. But geometry and other inconsistencies in design can make the capacitors un-balanced to the point of a slight mismatch. The resistors are the cause in that they allow un-equal voltages to form. But it is the capacitors charge storage ability that maintains this voltage imbalance when the high side of the capacitor is grounded. The worker thought that with the high and low sides of the capacitor pair at zero volts, he was safe. A simple check of the mathematics involved for 2 capacitors in series being charged by a DC voltage reveals the existence of a high voltage charge between the capacitors, even after the high and low ends are shorted to ground. The strength of this voltage depends on the degree of mismatch between the individual capacitors. Hence, testing the first-phase breaker produced no harmful results: the structural mismatch and the residual

voltage were small enough to dissipate through the capacitors shunt resistors without arcing through the air. But the voltage for the second breaker was significant enough to cause the arcing that was noted, and this was estimated by comparison to similar accidents to be one or more kilovolts. It should also be noted that after the top and bottom plates were grounded, the charge and hence voltage on the middle plates would have dissipated to ground over time through the resistors shunting each capacitor, with the shunt resistors being the leaking resistance through the dielectric SF6. However, since the values of shunt resistance were large, this would have taken about 10 minutes or more, and this amount of time was not part of the protocol for the hipot test. A quicker and safer protocol would have been to discharge the middle plates to ground.

Conclusion:

Keep all components in a Hi voltage circuit simple and rugged, and do NOT ever put two capacitors in series, unless you are prepared to ground the middle when not in use. But in general, 2 capacitors in series is a very bad idea.

Second Conclusion:

Even if the voltage levels are trivial (say 5 volts), it is always a bad idea to put 2 capacitors in series without shunting each capacitor by precision resistors. Suppose, for example, the leakage resistance of the first capacitor is X and the leakage of the second is 10X, where X is in billions of ohms. Then, the voltage splits 10-to-1 and not 1-to-1 as expected. If these capacitors are shunted by very large external resistors (say 10 megohm), then the voltage splits 1-to-1, since 10 meg \ll for any good capacitor, and therefore, the 10 meg resistors control the splitting of the voltage in an exact fashion.

Case #2: A sign hanger gets too near the high voltage in a telephone pole on a city street

A sign hanger is working on the outside wall of a building housing a factory in New York. The contractor has his worker go up in a bucket boom (aka cherry picker). The contractor is licensed by the city. His project is near a power line that feeds power to the factory. The voltage in the power line is 13,000, 3-phase. A transformer on the pole converts this to 220/120 volt at 3-phase, and sends this in to the factory. The worker is very successful in completing the work on the outside wall. He finishes over 90% of the sign. Then, suddenly, he slumps over in the lift bucket. He is being electrocuted via asphyxia. He can not breathe. A co-worker is located on the roof of the factory at the same level as the first worker. He reaches out toward the bucket to grab the first worker. But then, the co-worker suddenly is struck with muscle pain and burned over the greater part of his stomach. Electricity is now forming 2 circuits. It leaves the pole, travels through the air, and goes into the first man. At this point, the electricity splits. Some of it leaves the first man

by his upper torso and enters the second man who is grounded by contact with metal capping at the roof ledge. The electricity also leaves the first man at various points on his body and enters the bucket of the boom which is in contact with ground. The truck that supports the boom has metal feet placed down on the flat sidewalk for added mechanical strength. Later, after the truck is moved, there are burn marks on the sidewalk where the feet were placed in contact with the sidewalk. This is proof that electricity went through the boom to ground.



Figure 2. Telephone pole with 3-phase 13,000 Volt power cable near building (right) where accident occurred.

Analysis of this case:

Simply stated, the sign hanger was too close to the power source. His boss (a licensed sign hanger) failed to measure the proper and safe distance to keep from the power line. Alternatively, his boss could have contacted the power company to shut off the power, and he did not. The power company had the power wires close to the factory because the wall nearby was a non-maintenance wall, i.e. there was no indication of any activity that was to be carried on near that wall. As an example, a wall with a door or window is a maintenance wall. It would be expected that people would be entering the door or standing near an open window. Similarly, after the sign was installed, it too became a maintenance wall. But these facts should have been reported to the power company before the sign was placed.

Conclusion:

Contact the power company before you work near a hi-voltage line (any line with voltages of 600 volts and up). Alternatively, if you are using a boom or ladder or scaffolding, it is always a good thing to isolate it from ground. However, this might not be something that is always practical in the field.

Case #3: Master Electrician uses ordinary handheld voltmeter to measure 4000 volts

This case is very sad. It was totally avoidable. It produced only minor injury, but this in turn led to the death of a young man with a wife and children. A Master Electrician can train someone who has no knowledge of electricity and turn that person in to an electrician like himself. He is the Master of his trade. He was the victim of this accident. The Master Electrician is hired to work on staff at a large warehouse in New Jersey. There is almost a million square feet of space in this warehouse. It is so large that many smaller factories could conceivably be stored within its structure. The warehouse is undergoing change. There are over 300 different electric closets, and each closet has a multiple of different voltages in each of them. All of the voltages are low voltage (nominal 120, 240, and 480 volts, either single phase or 3-phase) with one exception. There is a 3-phase source of 2300 volts. It is generated at a local facility in a building next to the factory. There is a chain link fence around this building. It is not the type of place that you can just wander in to. The power from this source is fed into the warehouse and into one particular closet, almost identical to dozens of other electrical closets near it. Of the 300-plus electric closets, this is the only one that is high voltage. There is a large sign on this closet that reads: "Danger 2300 volts". There is a small sign (about one inch square) that reads the same thing. The closet is locked with a padlock. This dangerous voltage obeys the Lock-Out-Tag-Out protocol enforced on all dangerous voltages.

The Master Electrician is comfortable with all of the low voltages. His Fluke meter has a maximum rating of 1000 volts (DC/RMS AC). With a relaxed attitude, he randomly opens many different electric closets and measures a host of voltages in the course of his daily troubleshooting. There is NO set of master schematics for the factory, so our electrician is putting together his own set. Over time, the large sign that reads "Danger 2300 volts" either falls off the cabinet or is removed. The padlock is opened on the cabinet and later disappears. There are almost 1000 workers at this facility; consequently, it is hard to point a finger at anyone person. This sloppiness has now left 2300 volts inside a cabinet that anyone can open. The small warning sign (one inch square) remains, but the large sign is gone. In the course of his duties, the Master Electrician comes to the cabinet. As a Master Electrician, he is duty bound to read all he can before he opens the cabinet. Because he is in a hurry, he does not take notice of the one inch square sign. The cabinet is not locked. He assumes that the voltages inside are low. He hooks his Fluke meter to the first leg of a 3-phase arrangement. At this point, he could still come out of this

okay. Protocol dictates that you measure each UNKNOWN voltage with respect to ground. If he had done this, he would have 2300 volts sitting across his multimeter. The rule of 2 applies. The electrician's meter is capable of safely measuring 1000 volts. It can go up to 2000 volts without breaking. Beyond 2000, there is the real chance of serious damage. At 2300 volts, his meter should "smoke" and cause problems, but that is all. We verified this from testing in the laboratory, and our results are supported by the specs given for most Fluke meters, including the model involved in this accident. Instead of hooking his meter leads between ground and one leg of the 3 phases to measure 2300 volts, our Master Electrician hooks his two meter leads across two different phases. This is a shortcut. By doing so, he can cut his testing time in half; if the voltage is proper, he can verify 2 phases with one measurement. But this is dangerous, if the voltage is unknown.



Figure 3. Bright yellow fluke multi-meter is badly blackened (burnt) as a result of measuring 4000 Volts.



Figure 4. A sampling of the more than 300 electrical closets at a very large food warehouse in New Jersey.

Analysis of this case:

A voltage of approximately 4000 volts spans the electrician's meter. Note: for any two phases in a 3 phase system, the phase-to-phase voltage is the single phase voltage (2300) multiplied by the square root of 3, or approximately 4000 volts. This large voltage causes a massive current to travel into the meter. The meter is instantly burned and on fire. The current does not stop there. It continues to travel into the electrician's work gloves and into his hands and chest. He is severely burned. Eventually after a very long illness, he will die. Note: his work gloves are rated at 800 volts – they are safe for low voltages but they are not safe for high voltages.

Conclusion:

Follow the proper protocol when measuring any unknown voltage. Do not assume that your measurements are safe for the voltage you think you are measuring. Always tell yourself things like “suppose this voltage is much higher” or “suppose the label on the voltage is wrong”. Also, note that many electricians now use proximity voltage testers to assess power of an unknown source. These often fail to tell the exact voltage of the source, but they can determine the order of the voltage as being very low or simply low or high or very high. But these testers are incredibly safe in that there is NO need to actually touch or sample any electricity from the circuit under test.

Case #4: A landscaper receives 13,000 volts from a low voltage source

In the three previous cases, it is obvious that there was high voltage present. Even in the third case, the victim did not think he had a high voltage because of the sloppiness in the lock-out-tag-out procedures being followed and because he was not observant of the small warning sign that was in place. Yet, a high voltage was present, and with less sloppiness, this would have been apparent. In this case, there is NO expected high voltage. A landscaper is up on a ladder using an electric chain saw to cut branches. NOTE: this is not a recommended practice, since there is ample opportunity to lose ones balance and control of the saw. But routinely, people who prune and cut trees work on them while on a ladder. For our present study, we are not concerned with cases of falling off the ladder due to simple loss of balance. Our accident is more complicated—it is electrical in origin. At some point, the landscaper is cutting a thick branch. About halfway through the cut, the branch “binds”. It grabs the teeth of the chainsaw and holds them motionless. There is a great deal of energy generated as electricity is being converted by a motor into mechanical work or energy. When the teeth are suddenly brought to a stop, this energy must go somewhere. Most of the energy is dumped back from the motor into the electric circuit. This voltage is called a “back EMF”. It obeys the laws of Maxwell, but it is not a commonly expected form of electricity, except where motors/generators are involved.

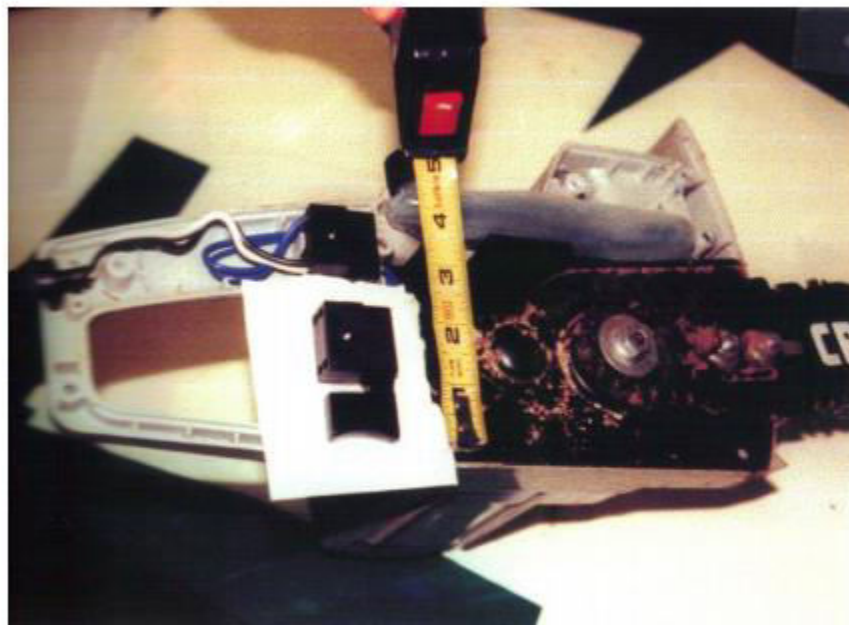


Figure 5. Chain saw with the cover removed.

Analysis of this case:

Figure 5 shows the chain saw with the cover removed. Except for the on-off switch and the motor, there are no electrical/electronic components in the chain saw. A black wire and a white wire enter the switch from a 120 volts AC source. Two blue wires leave the switch and go to the motor. A second switch is shown on a sheet of white paper for comparison – note the “fat” trigger button at the bottom of this second switch and the narrow neck connecting the button to the switch. A back EMF comes from the motor (acting as a generator) when the teeth of the chain saw are suddenly stopped. This was recorded as 13,000 volts. The saw was designed to withstand voltages several times greater than the 120 applied. However, it could not withstand the 13,000 volt back EMF. This leaked out through the casing of the saw and into the gloved human operator. Our results show that this voltage could sustain a current of 191 mA for at least 10 seconds. This would have been enough to kill the human. However, in this case the “wobbly” ladder became a safety feature. The human lost his balance and fell at the instant of being shocked. He broke one leg, but overall there was no permanent harm done to him due to electric shock.

Conclusion:

What is most amazing about this case is that we analyzed the plastic used to protect the human from unintended leakage currents. The point of greatest leakage for this accident is around the switch at the neck that connects the switch to the trigger button. The landscaper is touching the switch-button and applying a great pressure at the time of the accident. By making the plastic of the neck thicker, the voltage (even at 13000) can be prevented from leaking to the human. Our measurements showed that increasing the neck thickness by 1/16 inch could have shielded the human from the 13000 volts. This would add only pennies to the overall cost of the chainsaw. (To find the thickness of plastic needed to provide a safe shield to 13,000 volts, one can use the value of dielectric breakdown to come up with the value of 0.3 to 0.6 mm.).

Case study on major fire incident due to failure of crude booster pump

-S/Shri S.K. Bagchi, AD (Asset Integrity) & M.K. Dutta, AD (Process)

1.0 THE INCIDENT:

A major fire broke out in Crude Distillation Unit of a refinery. As per eye witness, initially the fire was around the crude booster pumps. Subsequently, the fire engulfed instrumentation & electrical cables, pipes in overhead pipe racks and heat exchangers in CDU.

At the time of the incident, 02 booster pumps (276m³/hr. capacity each) were in operation. During site visit, it was observed that the pump casing was totally damaged and torn into two pieces; dislodged towards the suction side by about 8 inch. The impeller was found detached from the shaft. The pump casing is made up of carbon steel, A-216 WCB.

The fire lasted for about four hours and caused extensive damage to all the 03 crude booster pumps, technological structures, pipe racks with piping, insulation, electrical and instrument cables are damaged due to fire. However, there was no injury / loss of life due to the fire incident.

2.0 SITE VISIT & OBSERVATIONS:

- Prior to the fire incident, the unit was running at a normal throughput of 350 M³ / hr.
- The crude booster pumps were taking suction from the flush drum at a temperature of 179 degC. The discharge pressure of booster pump was 31.5 Kg/Cm². The normal load of the motor was 44 – 45 A (full load 56 A).
- During the discussion with field operators on duty, it revealed that there was an explosion in the early morning hours (end of night shift).
- The shift in-charge after getting the information of fire, took action for emergency shutdown of the unit. The furnace was tripped from the control room. However, since there is no facility to isolate crude / product lines from control room, the lines were isolated manually, which is time consuming.
- The power supply to the unit was switched off from the substation by electrical personnel.
- The fire continued for more than four hours due to burning of the hold-up liquid in the flash drum, crude and product lines.
- Subsequently, fire spread to the nearby areas leading to major fire and consequential damage to pipe, fittings etc.

- The failed crude oil booster pump, at the time of the site visit, was not shifted to mechanical workshop and dismantled.
- The other observations/ inferences are as under:
 - a. Casing of crude booster pump was totally damaged & torn into 02 pieces.
 - b. The casing plate was cut circumferentially; there is no welding joint in the casing at the location of failure.
 - c. The thickness of the casing at the detached / cut location throughout the circumference is about 1.0 mm.
 - d. Such failure of the casing plate into two pieces is a clear indication of mechanical failure of the casing due to rubbing of impeller against the pump casing.
 - e. No significant internal corrosion was observed in the casing plate in general.
- All the three booster pumps and motors were affected due to fire. Technological structures of piping rack were also found severely damaged (Refer to photograph in Annexure-I).
- Process piping on the overhead rack like vacuum residue, kerosene, flushing oil, safety valve discharge line and HGO lines were opened up due to impact of the fire.
- Instrumentation and electrical cables of the nearby area were found fully burnt and damaged.



Burnt Instrument & Electrical cables

3.0 DISCUSSION:

- DCS records prior to the incident indicate unit was in normal operation. The graph showing crude flow rate, pressure, temperature and level of flush drum was steady. During the fire, the instrument and electrical cables which were passing through near

the crude booster pumps got burnt & thus there was no indication to control room / DCS after the fire.

- The failed booster pump was running at a pressure of 31.5 Kg/Cm² and 179 degC temperature; sudden release of crude to atmosphere at this condition resulted in a major fire and explosion.
- The history of the booster pump indicate the problem of high vibration and shaft jamming for which the pump was taken to mechanical work shop for repair/ maintenance. Subsequently the pump was taken on service & since then the pump was running.
- The failure / loosening of the Lock nut allowed the impeller detached; it moved towards the suction end (casing side) by the hydraulic pressure on the back of the impeller. This resulted in significant rubbing action of the impeller against the pump casing plate; the impeller acted like a cutting tool that cut the casing plate circumferentially into two pieces. This would have resulted in very high noise around the pump and high current.



Casing plate of crude booster cut circumferentially by rubbing action of impeller.

As a result, the impeller of the pump got detached due to shearing of the shaft near the lock nut. The friction between impeller and the casing is a possible source of spark generation to ignite the crude oil.



Detached Impeller from the shaft

- Failure of Lock nut of the Impeller is due to any one or combination of following :
 - (a) Axial vibration resulting in Load on the Lock nut leading to its failure.
 - (b) Inadequate tightening torque on the Lock nut at workshop during the overhauling.
 - (c) Integrity failure of the washer of the locknut or thread damage.

- It was also gathered that there was vibration of the suction piping connected with the pump which caused significant stress on the pump and contributed for the failure.

- Incidentally, there is no record of tripping of motor. The motor did not trip on overload during rubbing / cutting action of casing plate by the impeller. This indicates that the existing trip logic of the motor and trip current setting is faulty.

4.0 ROOT CAUSE ANALYSIS OF THE INCIDENT:

- 1) The root cause of the major fire is the failure of Lock nut of the Impeller. Failure occurred due to any one or combination of following:
 - (a) Axial vibration resulting in **Load on the Lock nut** leading to its failure.
 - (b) Inadequate **tightening torque** on the Lock nut at workshop during the overhauling.
 - (c) **Integrity failure** of the **washer** of the locknut or thread damage

Failure of the nut caused the impeller to move towards the suction end (casing side) and touch the casing plate by the hydraulic pressure on the back of the impeller. **This resulted in significant rubbing action of the impeller against the casing plate and the impeller acted like a cutting tool to cut the casing plate circumferentially into two pieces.**

- 2) Vibration of the piping connected with this pump.

- 3) The motor also did not trip on overload during cutting action of casing plate by the impeller. Therefore, the motor trip logic and trip current setting was not proper/ faulty.

5.0 RECOMMENDATIONS/ LEARNINGFROMTHE INCIDENT:

- 1) During pump overhauling, through inspection of the locking arrangement of the impeller with the shaft must be done to check for any deterioration or abnormality. It is to be ensured that impeller locking is done with appropriate torque and the same must be properly supervised for all critical pumps.

- 2) Preventive /predictive maintenance of pumps to be strengthened to avoid such incidents.
- 3) The motor trip logic and trip current setting must be looked into so that in case of any overloading, the motor is tripped automatically.
- 4) Vibration of the suction piping connected with the pump must be eliminated.
- 5) Periodic checks and vigil by field Operator during normal shift and shift change over time is essential to take timely corrective action.
- 6) A detail analysis of the pump failure is to be done in consultation with the OEM and other technical experts for establishing preventive / predictive maintenance procedure and actions to avoid such failure.
- 7) To minimize the adverse consequences from such incident, quick isolation at the suction of such critical pump is required thru ROV operable from field / control room.

CASE STUDY OF FIRE IN RESIDENTIAL BUILDING

Executive Summary:

This case study revolves around a recent fire in a residential building, its probable cause and the role of agencies to prevent them.

Incident:

A fire broke out in a penthouse of a building in Thane area. The cause of the fire is unknown, but certain tell tale marks lead to probable cause of loose contact in the plug circuit, which has gone unnoticed for a long period.

This fire has left behind two dead persons who were trapped in the apartment, and destroyed completely the two floor apartment. Certain pictures from the web are attached to show the extent of damage.

Disaster management personnel said the monstrous blaze could not be controlled as the entire furniture, flooring and the staircase connecting the duplex apartment was wooden. The house fire spread quickly and in the blink of an eye the entire apartment was up in flames. There was no way to douse these flames at that point of time as the entire apartment was decorated up with wooden furniture. The house flooring was wood-based, the staircase that led to the duplex apartment was made of wood and so were all the wardrobes and other furniture.

Fire brigade pressed into service four fire tenders and a bronto skylift. The firefighting operations were delayed as the skylift could not be positioned properly due to the trees in the compound.





Observation of the above Electric Fire:

*** Cause of electric fire is not known, but news item attributes to short in plug circuit.***

Probable Cause of Electric Fire:

- At that time no equipment may be ON except the Air Conditioner, as the point of fire is reported in the plug circuit.
- Are Plug Socket dangerous in India? Yes as the prefabricated plug which comes with the equipment do not have a tight contact within the socket, resulting in loose contact. Loose contact, results in localized heating and if not noticed in time end up in fire.
- Earlier days electric equipments be it iron, heater or toaster were not supplied with plug. Consumers would purchase plug of the brand whose socket is used in the house. Hence chances of loose contact in the plug socket was rare. Now it is common. No pre fabricated plug fits tight in the socket, due to absence of standardization of the plugs.
- During 1985 to 1995, while installing UPS for Computers, it was noted that the prefabricated imported plugs were loose in Indian sockets. Lose contacts in these cases also use to cause computer rebooting – data loss etc and there was a trend to blame UPS for all that !!!

- Despite reluctance from heavyweights in computer manufacturing like WIPRO, HCL etc, it formed necessary to cut imported PLUGS which use to be part of mains cords and reconnect with proper size Indian plugs ---- just to avoid lose contacts. But many were afraid of loss of warranty from the OEM.

How Such Fires can be prevented:

- All should periodically inspect the plug socket of equipments when loaded. A touch will reveal whether the plug is warm or normal. If found to be warm or hot, there will be tell tale marks of loose contact by blackening of pins. In this case both the plug and the socket needs replacement.
- Extension boards should not be used for high current equipments like Water heater, Refrigerator, Cooking heater, Air conditioner etc.
- This penthouse was full of fashionable interiors with lavish use of wood, varnish etc. So the fire was of massive scale. Avoid massive use of wood, veneer, polish, oil paint, these are only ornamental.
- All interior wiring needs change every 15-20 years depending on the additional equipment load one adds to his comforts.

How Utilities can Contribute to prevent these fires:

- Supply undertakings some times take short cut to maintain service/power supply . When old cables get defect on one phase they merrily shift total load on two or even one phase. This results in over loading and resultant failure of insulation & fire. The meter board is made of wood. That catches fire. Volunteers use sand to quench fire. Which is not effective. Fire extinguishers are rarely available. If available no body knows whether this can be used for fires on electrical equipment. Rarely one knows how to use if suitable. By the time fire flames become visible and chaos prevails.
- All old buildings have meter board under the ground floor staircase and mounted on Wood. The condition of the meter board and the incomer is alarming. Utilities should undertake disconnection of Power supply and its restoration only after the meter board is set right.

How Architects, Building Contractors can contribute to prevent these type of Fires:

- Insist on low smoke halogen free wires/cables, in residences.
- Architects and builders should note that grills if used in the façade of building shall have one open window to aid fire escape. Every building should have free

access around for fire tenders. The movement of emergency vehicles should not be hindered by trees. Safety audits shall be periodic and comprehensive.

- Architects through change in government rules will have to be told to relocate meter rooms away from staircase.
- The incidents of fire are on the rise even when tech advances providing heat , smoke sensors, fast acting isolators and protectors, advanced fire fighting systems are drummed up daily at various platforms. Fires in all types of establishments are on the rise.
- There has to be standardization of internal wiring used by builders to keep in mind the probable equipments which every one can use. Also the ignorance of use of these equipments by inmates should be considered and sufficient safety measures taken.

How Manufacturers can contribute to prevent these type of fires:

- Some standardization is desperately required, to match Indian sockets with prefabricated plugs which comes with the equipments which are manufactured in India or abroad.

Compiled By

A V Prasanna

Electrical Safety Case Study #1

A 30-year-old male electrical technician was helping a company service representative test the voltage-regulating unit on a new rolling mill. While the electrical technician went to get the equipment service manual, the service representative opened the panel cover of the voltage regulator's control cabinet in preparation to trace the low-voltage (120 V) wiring in question (the wiring was not color-coded). The service representative was not using PPE.



Worker was performing testing on the circuit without PPE.

What should have been done before the cover was removed?

The service representative climbed onto a nearby cabinet in order to view the wires. The technician returned and began working inside the control cabinet, near exposed, energized electrical conductors. The technician tugged at the low-voltage wires while the service representative tried to identify them from above.

Suddenly, the representative heard the victim making a gurgling sound and looked down to see the victim shaking as though he were being shocked. Cardiopulmonary resuscitation (CPR) was administered to the victim about 10 minutes later. He was pronounced dead almost 2 hours later as a result of his contact with an energized electrical conductor.

List the procedures and steps that should have implemented to prevent this accident.

What personal protective equipment should have been used?

Electrical Safety Case Study #2

A worker was attempting to correct an electrical problem involving two non-operational lamps. He examined the circuit in the area where he thought the problem was located. He had not shut off the power at the circuit breaker panel and did not test the wires to see if they were live. He was electrocuted when he grabbed the two live wires with his left hand. He collapsed to the floor and was found dead.



What procedures should have been put in place to prevent this accident?

Describe the steps in the procedures

2.5 Case Study: Electrical-Related Injury

While performing preventive maintenance to a motor controller in an industrial facility, an electrician received a 4800V shock that resulted in a critical injury.

The electrician (the victim) was part of a two-man crew working for an electrical contractor doing preventive maintenance (PM) on the motor controller (MCC) powering the Heating Ventilation and Air Conditioning (HVAC) unit for the plant. This was a task the contractor, including the two electricians, had done for the facility many times without incident. The lead electrician had previously performed PM on this MCC but had done the work alone.

To perform this task as part of the facility's safe work procedure, the crew first had to obtain a Safe Work Permit from the facility. The process requires a contractor to fill out the form, have it signed off by their contact person at the plant and then proceed with the work. Once the work is completed, the contractor completes the checklist on the Safe Work Permit, signs it and returns it to their contact person.

The scope of work for the MCC entails inspecting and cleaning all contactors and cells of the unit. It involves rolling the contactors out of their respective cells (Figure 1), inspecting and cleaning the cells and the contactors, and then rolling the contactors back into place. Prior to rolling a contactor from its cell, the contactor must first be mechanically disengaged from the buss of the MCC so that it is de-energized and can be pulled out of the cell. This procedure is called racking. Racking is done twice, once when disengaging (racking out) and the second time when engaging the contactor back into place (racking in).

The lead electrician briefly discussed with the victim the task at hand before starting work. They performed PM on the first three cells without incident.

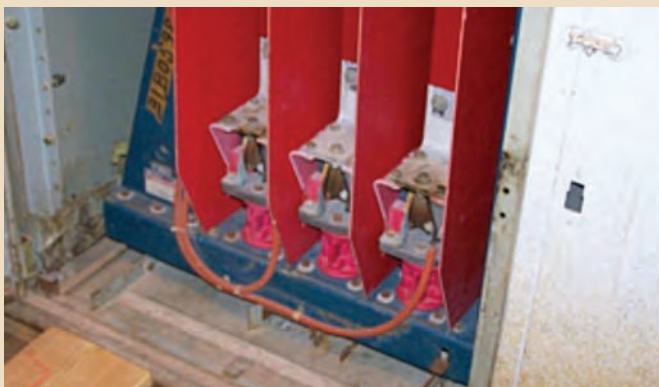


Figure 1: Contactor would be rolled out of the cell using the built-in rails in each compartment.



Figure 2: Highlighted on the top left is the racking handle for R1 starter, and bottom right is the racking handle for Q101 ("M" starter).

2.5 Case Study: Electrical-Related Injury (continued)

While the victim rolled contactor “B” out of Cell 3L (Figure 3) and completed PM on it, the lead electrician did the same with contactor “A”. The lead electrician completed PM on contactor “A” then rolled it back into Cell 2U. Then, he cleaned and checked Cell 3L while the victim was completing PM on contactor “B”. The lead electrician then closed the door for Cell 2 and went to the truck to retrieve his face shield and gloves. With his Personal Protective Equipment (PPE) on, he exercised the racking handle two or three times. There was no discussion between himself and the victim about exercising the racking handle before proceeding to do so.

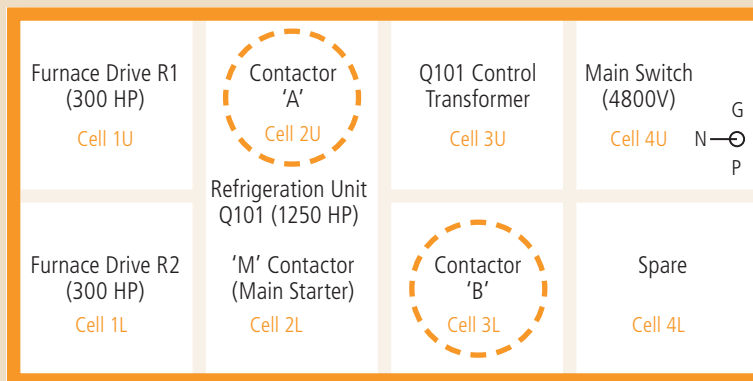


Figure 3: The highlight on Cell 2U shows where the lead electrician was when exercising the racking handle, the highlight on Cell 3L shows where the victim was crouching at the time of the incident

After exercising the racking handle, the lead electrician returned to his truck to drop off his PPE before heading back to help the victim with his work. He found the victim on the floor. He had received a shock while making contact with contactor “B” through the A and C phases. He performed CPR until help arrived and Emergency Response was called in. The victim survived, but lost both of his arms as a result.

The investigation found:

- There was no line diagram of the MCC, and the crew did not request to see the diagram before starting work;
- Contactors “M” and “B” shared the same branch in the circuit, meaning that when in the closed (energized) position, the circuit was completed and the machine was energized;
- When contactor “M” was racked in, 4800V was fed into contactor “B” through the exposed buss;
- When Cell 3L door was open, the buss mentioned above was still energized;
- No attempt was made to lock out the entire station. The main switch for the unit was located on Cell 4U (Figure 3) and workers assumed it was safe to work on the machine once they received the work permit.

2.5 Case Study: Electrical-Related Injury (continued)

Causal Factor 1:

Crew did not consider the hazards when there was a change in work method

According to the lead electrician, PM was previously performed on this equipment without incident and the PM had always been performed by one technician on one cell at a time. The electrician did not realize that working with two people introduced new hazards. The awareness of the associated hazards would have led to several other preventative measures (indicated below as other causal factors to this incident, such as reviewing electrical schematics as well as lock and tagout).

Causal Factor 2:

Crew did not review schematics of equipment or line diagram

It is unknown whether the line drawings for MCC-42 were reviewed in previous visits by the contractor, but no one reviewed the electrical drawings for this particular job on the day of the incident. As well, the lead electrician indicated that the drawings in the control cell appeared to be a control diagram and not a line diagram.

Causal Factor 3:

No hazard assessment was performed by the client or contractor crew

Aside from a brief discussion of the work to be performed, no hazard assessment was conducted by the facility or contractor crew. No discussions took place between the contractor and customer regarding potential hazards involved with performing PM on the MCC. The crew did not perceive that the work related to this assignment posed any hazard.

Causal Factor 4:

Safe Work Permit failed to identify gaps in the contractor's work procedure

The facility owner's criteria for granting a Safe Work Permit is unknown because the document was not obtained during the investigation. Best practice for Safe Work Permits typically includes identification, assessment and control of the hazard. The investigation points to a gap in either the criteria of granting a Safe Work Permit and/or the review process of the Safe Work Permit conducted by the facility owner.

2.5 Case Study: Electrical-Related Injury (continued)

Causal Factor 5:

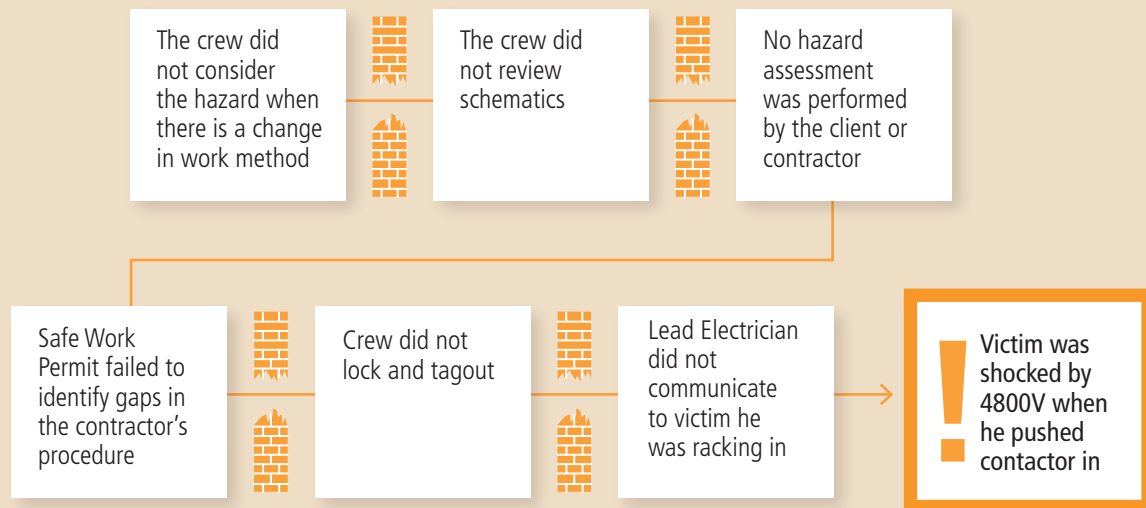
Crew did not lockout and tagout in accordance with the Occupational Health and Safety Act & Regulations Requirements (OHS)

OHS and Regulations requires a lockout of the power supply to be implemented when two or more individuals are working on the same equipment. Both the customer and the contractor have written procedures for lockout and tagout which were not followed.

Causal Factor 6:

Lead Electrician did not communicate to the victim that he was racking his unit in

While the victim was performing PM on contactor "B", the Lead Electrician racked his contactor in without informing the victim of his action. This action energized the Lead Electrician's unit and the victim's.



4.5.1 Case Study: Fire Example #1

The OFM was called to a fire at a two-and-a-half-storey single family detached dwelling that resulted in a fatality and \$1.2 million in property damage.

The investigation found:

- The structure was wood-framed construction, The exterior was a combination of brick on the ground floor and Tudor style wood and stucco on the second floor. The first floor included a living room, a dining room, a kitchen and a library. The basement stairs were close to the front hall. The basement consisted of an open storage area on one side, and a partition wall and door on the other side which lead to a laundry/utility room.
- The main and second floor sustained primary heat and smoke damage. Fire damage was detected on the main floor at the top of the basement stairs and travelled into the hallways towards the kitchen. Fire did break through in some areas on the second floor.
- Fire damage to the main and second floor confirmed the origin of the fire, which was below the main floor (i.e. the basement). Fire damage travelled up from the basement stairwell to the main floor.
- The outer wall of the laundry room was less damaged than the interior, with the highest degree of charring above the electrical panel, which was located in the laundry/utility room.
- The smoke, heat and fire patterns identified the area of origin as the basement ceiling joist spaces by the electrical panel.
- Obvious non-compliant wiring installation was observed. Conductors were left unsupported for long spans.
- The fire was electrical in origin. The investigation determined that the fire originated in the laundry/utility room area. Based on the fact that soot left on window glass was on the interior side as opposed to the exterior, it was determined that the fire started from the inside. There was no other source of ignition in the area, making electrical the only source of origin.



4.5.1 Case Study: Fire Example #1 (continued)

The OFM hypothesized two competent sources, both were electrical wiring.

1. Damage to a branch circuit in the area of origin resulted in the failure of the conductor's insulation and localized arcing. This ignited the conductor's insulation and the fire spread to lightweight fuels in the area, (i.e insulation on the ductwork and/or paper backing on the subfloor).
2. There was arcing through char (also called arc tracking or carbon tracking). Branch wiring was not installed properly in this area of the basement and through floors and wall cavities. It is possible that wiring may have impinged and overtime degraded the conductor's insulation. The result was the production of char through the pyrolysis of the insulation. The charred insulation became conductive and allowed the current to flow in an unintended path resulting in arcing between the energized conductor to either the ground or the neutral. This can happen in a localized area and over a long period of time. As the current progressively increases there is a continued build-up of char and insulation can fail resulting in arcing, provided the breakers do not activate – when the current drawn is generally low and the breaker may not activate (Dehaan, 2007, 397).



4.5.2 Case Study: Fire Example #2

An electrical stovetop fire causing a fatality, a serious injury and damage to the property.

A fire on the ground floor of a detached two-storey residential dwelling resulted in one fatality and serious injury to another person. The fire, which was investigated by the local fire department, police and OFM, was caused by a cooking oil pot on an energized burner of a stove in the kitchen.

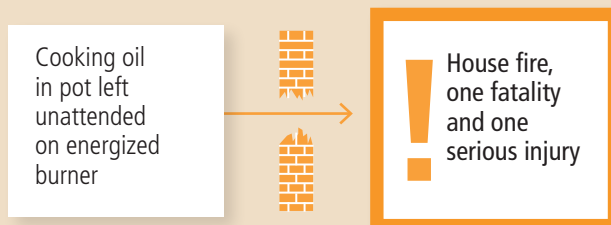
Some of the resulting damages in the house were:

- charring surfaces and consumption of paint finish from the kitchen cupboards closest to the stove
- discolouration and oxidation to the side of the refrigerator closest to the stove with an area of demarcation aligning with the height of the stovetop
- discolouration and oxidation mostly concentrated towards the left side of the stove housing the burner controls
- consumption and melting of the front left burner of the stove
- stainless steel wire structural component for deep frying foods was the only identifiable component on the front left burner of the stove
- soot build-up and consumption of paint finish towards the upper portions of the walls of the main hallway and stairway to the second floor
- soot deposits on the enclosing walls and furnishings of the two bedrooms on the second floor
- charring of furniture and soot build-up along upper portions of the walls in the living room
- soot deposits on the walls and furnishings of the washroom on the main floor



4.5.2 Case Study: Fire Example #2 (continued)

Four people were in the house when the fire started. When they detected an odour and smoke migrating through the kitchen doorway, three people exited the house. One of them re-entered in an attempt to save the fourth person but neither was able to escape. Both people were found in the master bedroom on the second floor, but one did not survive. The cause of death of the deceased was determined to be due to asphyxiation.



The investigation found:

- The point of origin of the fire was determined to be the front left burner of the stovetop. No evidence could be found to indicate any other point of origin in the house.
- The fuel for the fire was the high temperature oil in the deep fryer on the front left burner of the stove.
- Natural ventilation effect and the open kitchen doorway allowed the fire to spread out through the door, across the main hallway and up the stairs to the bedrooms.
- The source of ignition from the point of origin was deemed to be the heat from the burner which was left in the ON position and set to HIGH.
- Ceiling construction was lath and plaster. Interior construction had a combination of lath and plaster/gypsum indicating the building was originally built at least 50 years ago.

The incident underscored the need to be aware when cooking and to never leave the stove unattended.





Relevant Case Studies from EPRI's Power Quality Audits

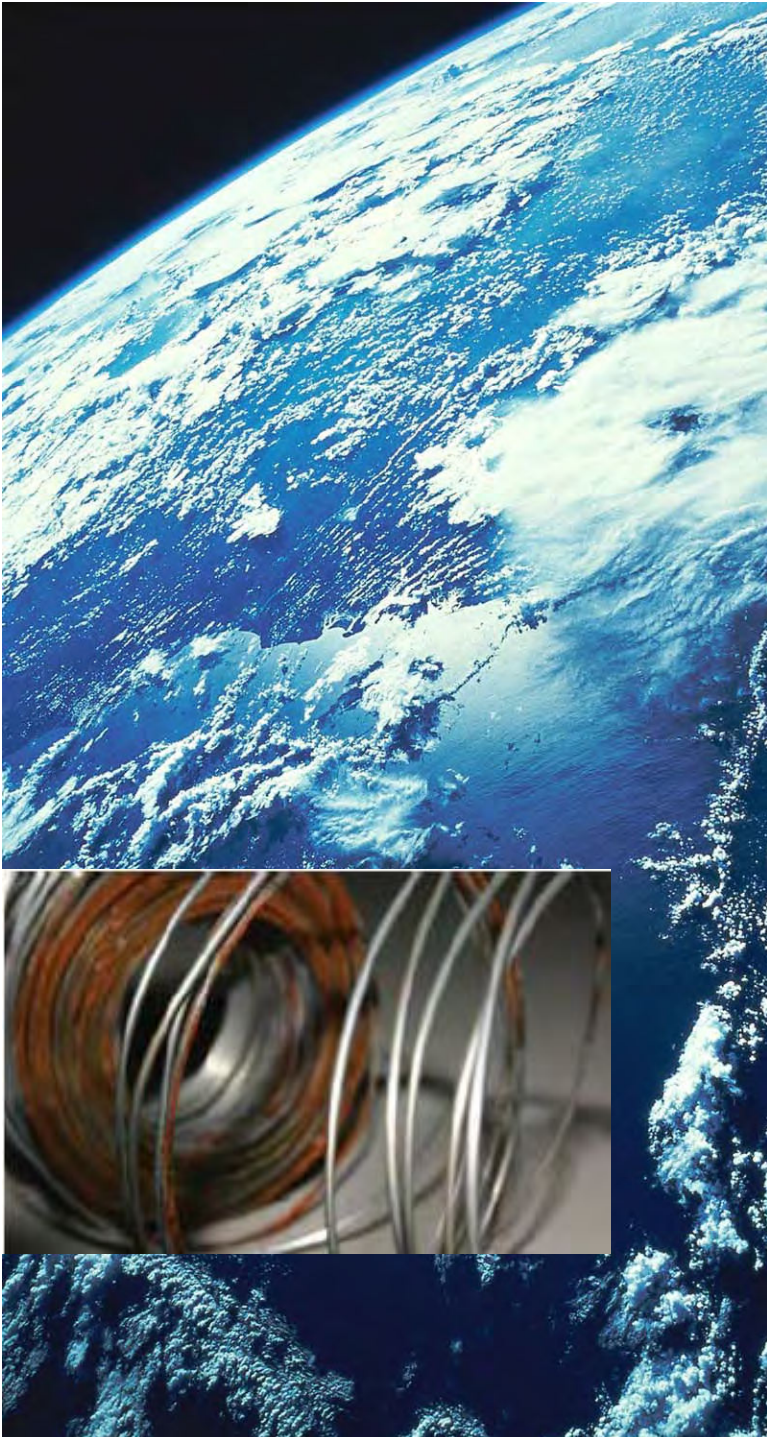
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Case Studies

- 1. Case Study Magnet Wire Plant Resolves PQ Issues**
- 2. Industrial Case Study: Monitor Manufacturer**
- 3. Gypsum Board Manufacturer Experiences Sudden Downtime**
- 4. Power Quality Investigation of a Manufacturing Plant**
- 5. Automotive Part Supplier Case Study – Flywheel Applications**



#1) Case Study Magnet Wire Plant Resolves PQ Issues



Introduction

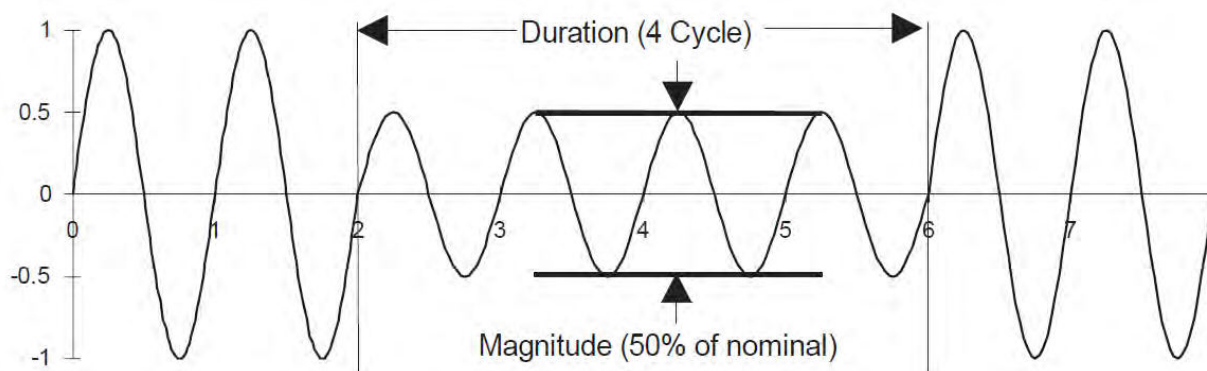
- A magnet wire plant experienced voltage-sag-related process upsets on several of its wire manufacturing lines.
- The plant load was approximately 5 MVA and was fed from three 2-MVA transformers.
- In addition to the wire lines, other important process sections of the plant include a rod mill and enamel, lubricant, and mechanical-room systems.
- In order to decrease the susceptibility of the plant to power quality (PQ) disturbances, the local utility supplying the magnet wire plant requested that EPRI provide a detailed PQ audit.
- The PQ audit revealed that several controls were susceptible to power quality disturbances.

Background (1)

- The need to provide reliable power with a steady voltage and frequency has been recognized since the inception of the electric utility industry.
- Voltage sags are the most important power quality variation affecting equipment because statistically they are the most frequent.
 - This was determined in the EPRI Distribution Power Quality (DPQ) study.
 - Lightning strikes, animals, fires, equipment failure, auto and construction accidents, and wind are some of the causes for power system faults.

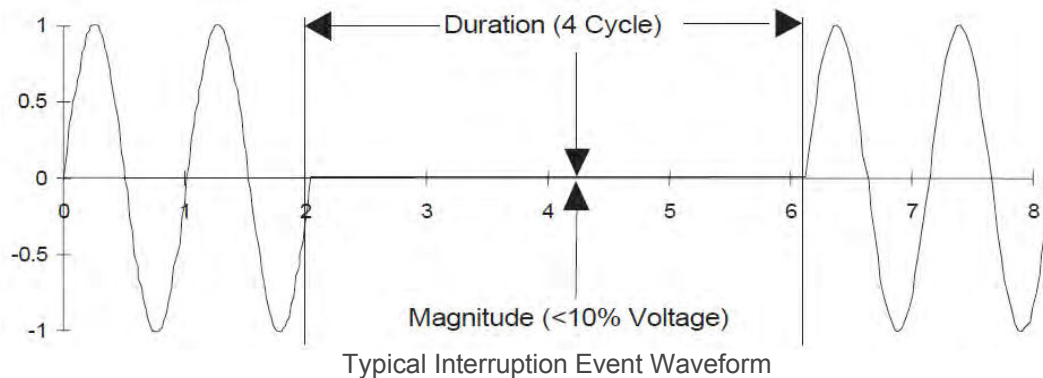
Background (2)

- Voltage sags, a decrease in RMS voltage at the power frequency for durations of 0.5 cycles to 1 minute, and interruptions are caused by faults (short circuits) on the power system.
- The location of the fault and the power system configuration determine the severity of voltage sags, while the power system protection scheme usually determines the duration.
- Below is a voltage sag characterized by a duration of four cycles and a depth of 50%.

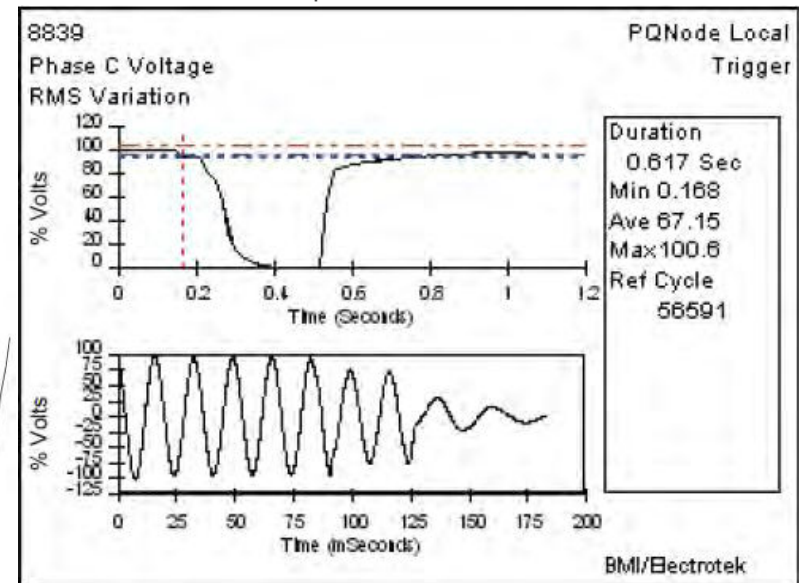


Background (3)

- In the United States, a typical voltage sag is:
 - 6–10 cycles (100–167 milliseconds) in duration
 - Greater than 60% to 70% of nominal voltage in magnitude
 - Typically single-phase and appears in either one or two phases inside the plant.
- A momentary interruption occurs when the supply voltage decreases to less than 10% of nominal for a period of time not to exceed 1 minute.
 - These Interruptions are measured by duration since the voltage magnitude is always less than 10% of nominal.
 - Typical duration for interruptions is 30–120 cycles (0.5–2.0 seconds) and depends on recloser fault clearing time.



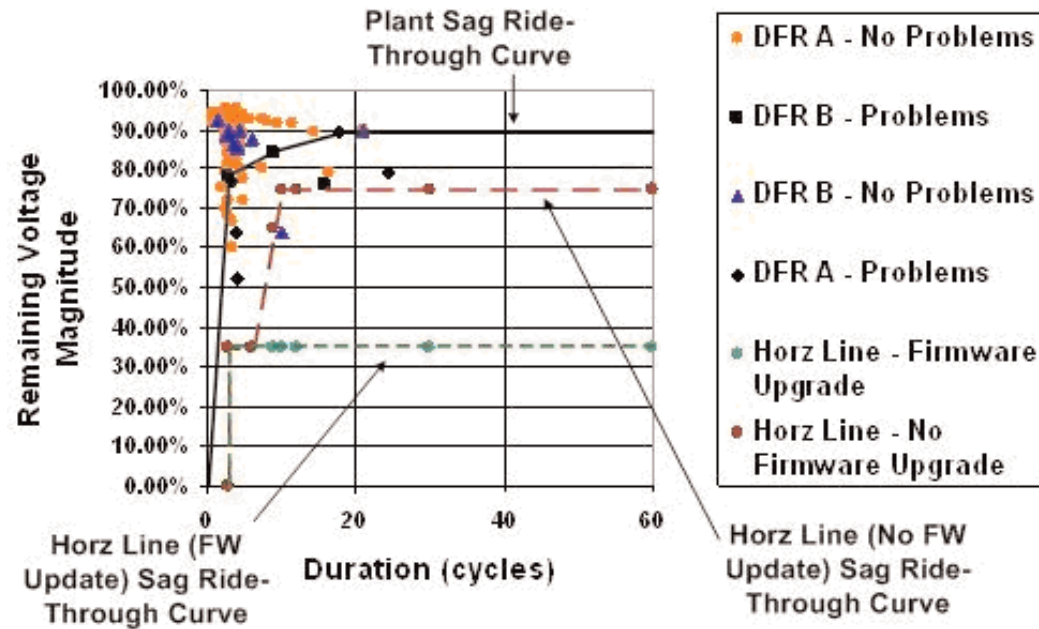
Actual Interruption Waveform and RMS Plot



Background (3)

- The magnet wire plant is supplied by a local substation that is fed from a tapped 115-kV transmission line jointly owned by two other utilities.
- The “scatter plot” below shows the voltage sags experienced by the plant from April 2000 to October 2001.
 - It is a composite of single-phase data from the 115-kV line and the plant’s incoming transformer voltage.
 - The PQ data was recorded by two digital fault recorders (A and B).
- Analysis of the data reveals that the magnet wire plant had reported upsets for voltage sags ranging from 3 cycles, 78% of nominal voltage to 18 cycles, 89% of nominal.

Actual Interruption
Waveform and
RMS Plot



Plant Power Quality Assessment (1)

- The magnet wire plant utilizes programmable logic controllers (PLC) and AC drive technology as the backbone of the control systems.
- Typically, the characteristics of a robust PLC-based control system are:
 - DC-powered PLC power supply
 - DC-powered input/output (I/O) and control power
 - Robust AC drives
- A scoring system was used to evaluate the susceptibility of various manufacturing lines in the plant to power quality disturbances.

Summary of Power Quality Attributes for PLCs and AC Drives

Equipment	Power Quality Influences			
PLC	DC-Powered Rack Power Supply Enhances PQ Robustness (+1)	AC-Powered Rack Power Supply Decreases PQ Robustness (-1)	DC Powered I/O Enhances PQ Robustness (+1)	AC Powered I/O Decreases PQ Robustness (-1)
AC Drive	DC Bus Trip Level Set Low (50% Range) Enhances PQ Robustness (+2)	DC Bus Trip Level Set High (80% Range) Decreases PQ Robustness (-2)	Lightly Loaded AC Drive Enhances PQ Robustness (+1)	Heavily Loaded AC Drive Decreases PQ Robustness (-1)

Plant Power Quality Assessment (2)

- Based on this summary table, it is apparent that the magnet wire plant uses a large number of drives.
- The PQ audit revealed that several PLCs and I/Os are AC powered, making them susceptible to voltage sag events.

System	Plant Area	Number of Lines	PLCs (total per system)	AC Drives (total per system)
Process Systems	Rod Mill	1	3	None
	Horizontal Oven Lines	56	70	352
	Vertical Oven Lines	12	16	72
	Enamel System	1	1	None
	Lubricant System	1	1	None
	Machine Room			2
Total			91	426

PLC Cabinet Powered by AC with a Mixture of AC and DC I/O



DC-Powered PLC and I/O with Four Motor Drives



Plant Power Quality Assessment (3)

- The weighted calculations for each process area's PQ performance is scored based on the system discussed earlier.
- Scores of zero or less are susceptible to voltage sags and all others have some degree of robustness

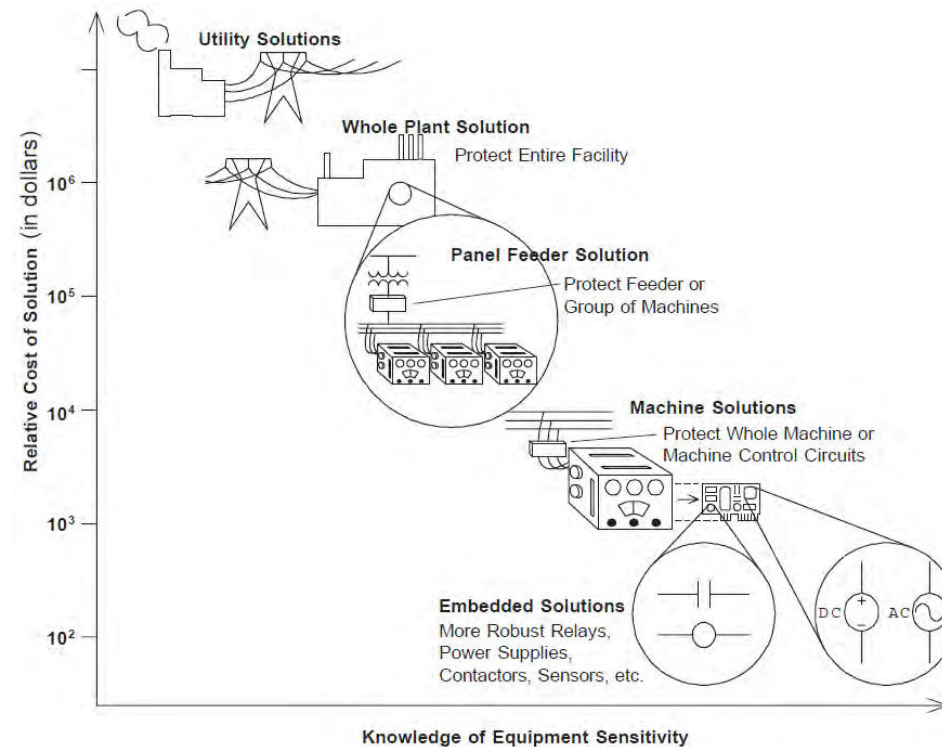
Weighted Score Assessment of Various Manufacturing Lines in Magnet Wire Plant

Plant Area	Number of Lines	PLCs				AC Drives		Plant Area PQ Score
		AC I/O?	DC I/O?	AC PLC Rack Power Supply?	DC PLC Rack Power Supply?	DC Bus Trip Level (80% Range)	DC Bus Trip Level (50% Range)	
								Score > 0 means robust Score <= 0 means susceptible
Rod Mill	1	No	Yes +1	Yes -1	No	Other DC drives used	Other DC drives used	0
Horizontal Oven Lines	56	No	Yes +1	No	Yes +1	Yes -2	No	0
Vertical Oven Lines	12	No	Yes +1	No	Yes +1	Yes -2	No	0
Enamel System	1	Yes -1	Yes +1	Yes -1	No	Drives not used	Drives not used	-1
Lubricant System	1	Yes -1	Yes +1	Yes -1	No	Drives not used	Drives not used	-1
Mechanical Room PLC	1	Yes -1	Yes +1	Yes -1	No	Yes -2	No	-3

Recommendations for Hardening Magnet Wire Plant to Power Quality Disturbances

- A detailed assessment and inspection of various electrical controls in the magnet wire plant revealed that several manufacturing lines were susceptible to power quality disturbances.
- The audit recommended all possible options with particular emphasis on low-cost modifications by changing AC drive firmware and adding small power conditioners to control circuits in the plant.
- Power quality solutions can range from thousands of dollars to millions of dollars.

Effect of Equipment Sensitivity
Information on Cost of PQ Solution



Recommendations for Hardening Magnet Wire Plant – Distributed Power Conditioning

- A number of controls in the magnet wire plant are fed from AC power.
 - One recommendation is to provide small “batteryless” power conditioners for equipment supplied by AC control transformers.
 - The power conditioners can be installed on the secondary side of the control power transformers.

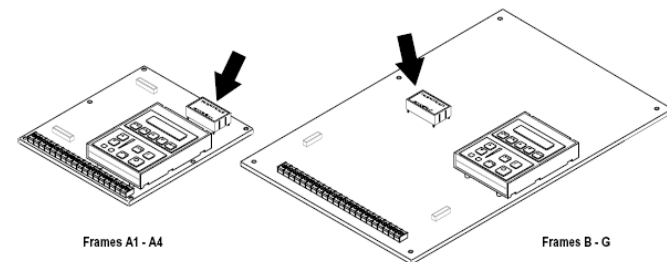
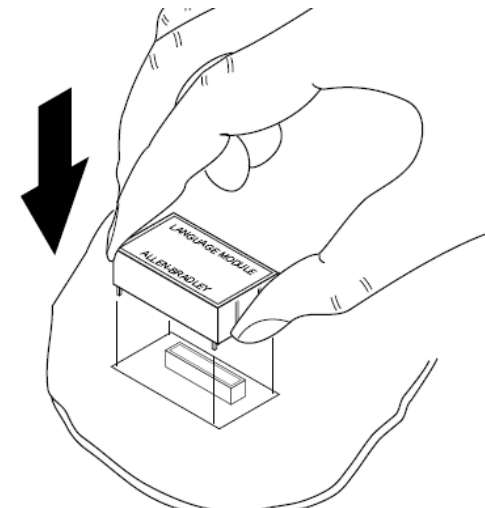


CVT and
PowerRide RTD DPI and VDC DySC

Example Batteryless Power Conditioners

Recommendations for Hardening Magnet Wire Plant – Firmware Upgrade

- The magnet wire plant uses several AC drives of a single make.
- AC drives are susceptible to voltage sags in which the DC bus level drops to 81% of nominal or less.
 - Test results at EPRI in the past indicate lowering the DC bus trip level will greatly increase the ride-through.
- Each drive must be retrofitted with a new language module firmware revision to allow a lower DC bus voltage trip setting to 50%.
- This is a typical low-cost solution as firmware upgrades are relatively inexpensive.



Cost-Benefit Analysis of Recommended Power Quality Improvement Solutions

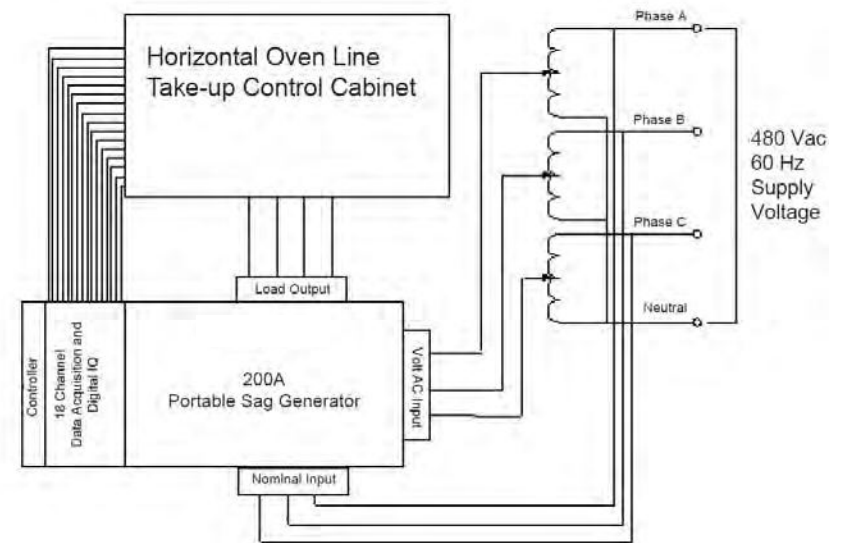
- Below is a summary of the recommendations and estimated typical costs based on the first two recommendations in the previous slides (distributed power conditioning and firmware upgrades).
- For the purposes of cost calculation for the third recommendation (using a centralized power conditioning system), a mid-range price of \$300 per kVA will be used.
 - The centralized method equates to roughly \$600,000 per 2-MVA transformer or \$1.8 million for 3 transformers.

Cost for Distributed Power Conditioning and Firmware Update Recommendations

Area	Recommendation	Number Required	Cost
Rod Mill	Small batteryless power conditioners	2	\$2,780
Horizontal Lines	Drive firmware upgrade kit	352	\$70,400
Vertical Lines	Drive firmware upgrade kit	72	\$14,400
Enamel System	Small batteryless power conditioners	1	\$1,690
Lubricant System	Small batteryless power conditioners	1	\$1,690
Mechanical Room Systems	Small batteryless power conditioners	1	\$1,690
	Drive firmware upgrade kit	2	\$400
Total Cost			\$93,050

Test Validation of Recommendations (1)

- PQ testing was performed on one selected line to evaluate the actual line susceptibility as well as to validate the low-cost recommendation of upgrading firmware and setting drive bus trip level to 50%.
 - Line testing was conducted to prove firmware upgrades improved the ride-through performance.
- The testing strategy was to characterize the AC drives with the firmware upgrade installed and then test again without the existing firmware revision.
- The voltage sag generator was placed in series with the 480-Vac source and the take-up control.



EPRI Voltage Sag Generator
Electrical Hook-Up

Test Validation of Recommendations (2)

- The oven was tested at various voltage levels and durations to characterize the ability of the equipment to ride through voltage sags.
- Below lists the test points agreed upon by the team and all voltage sags were performed phase to phase.

Horizontal Line Take-Up Drive Cabinet



Voltage Sag Test Points

Test Number	Sag Duration (60-Hz cycles)	Sag Duration (seconds)	SEMI F47 Ride-Through Curve Sag Depth (% Vnominal)
1	3	0.05	50
2	6	0.1	50
3	12	0.2	50
4	30	0.5	50
5	60	1	50

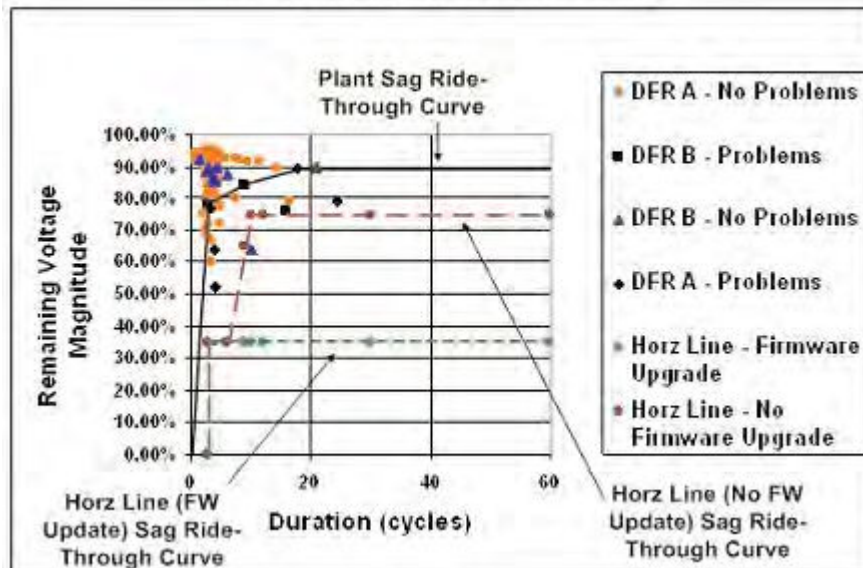
Test Validation of Recommendations (3)

- During the sag testing of the horizontal line with the firmware upgrades, it was discovered that a two-phase sag of any duration to 60 cycles with a magnitude down to 35% nominal would not trip AC drives off-line.
 - Testing below 35% of nominal was discontinued as the inrush current was in excess of 90 amps and might destroy the rectifiers in the drive.
- Similarly, the test was repeated on a line with no firmware updates installed.
 - The unprotected drive yielded its first trip at 12 cycles, 70% nominal by shutting down the drive, thus breaking the magnet wire.
- Repeated testing revealed that the unprotected AC drives tripped more often.

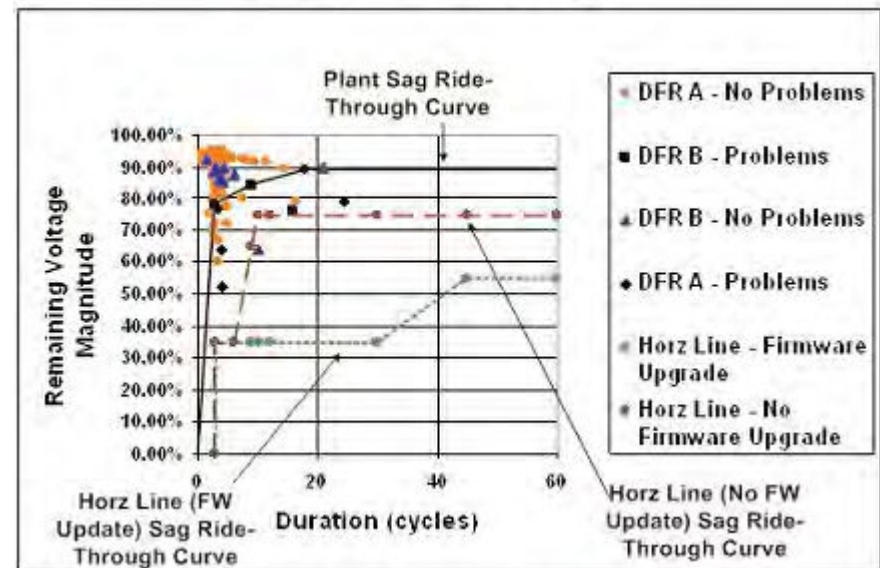
Test Validation of Recommendation (4)

- Based on the testing, sag ride-through curves were compiled.
- ***These curves show that a simple update to the drive firmware and resetting of the DC bus trip levels to 50% will significantly harden the line's susceptibility to voltage sags.***

Firmware Update Results for A-C and B-C Sags



Firmware Update Results for A-B Sags





#2) Industrial Case Study: Monitor Manufacturer



The “Engineering” of Embedded Solution

- Initial dialogue established between plant personnel and utility PQ group.
- Remote gathering of information, plant/equipment one-line diagrams, process upset logs, PQ monitoring data.
- One week investigation at the plant
 - Get buy-in from the process managers
 - Understand the process
 - Talk with the process floor people
 - Evaluate sensitivity
 - Investigate hidden weak links
 - Evaluate solution options
 - Cost benefit analysis
 - Recommendation to process managers

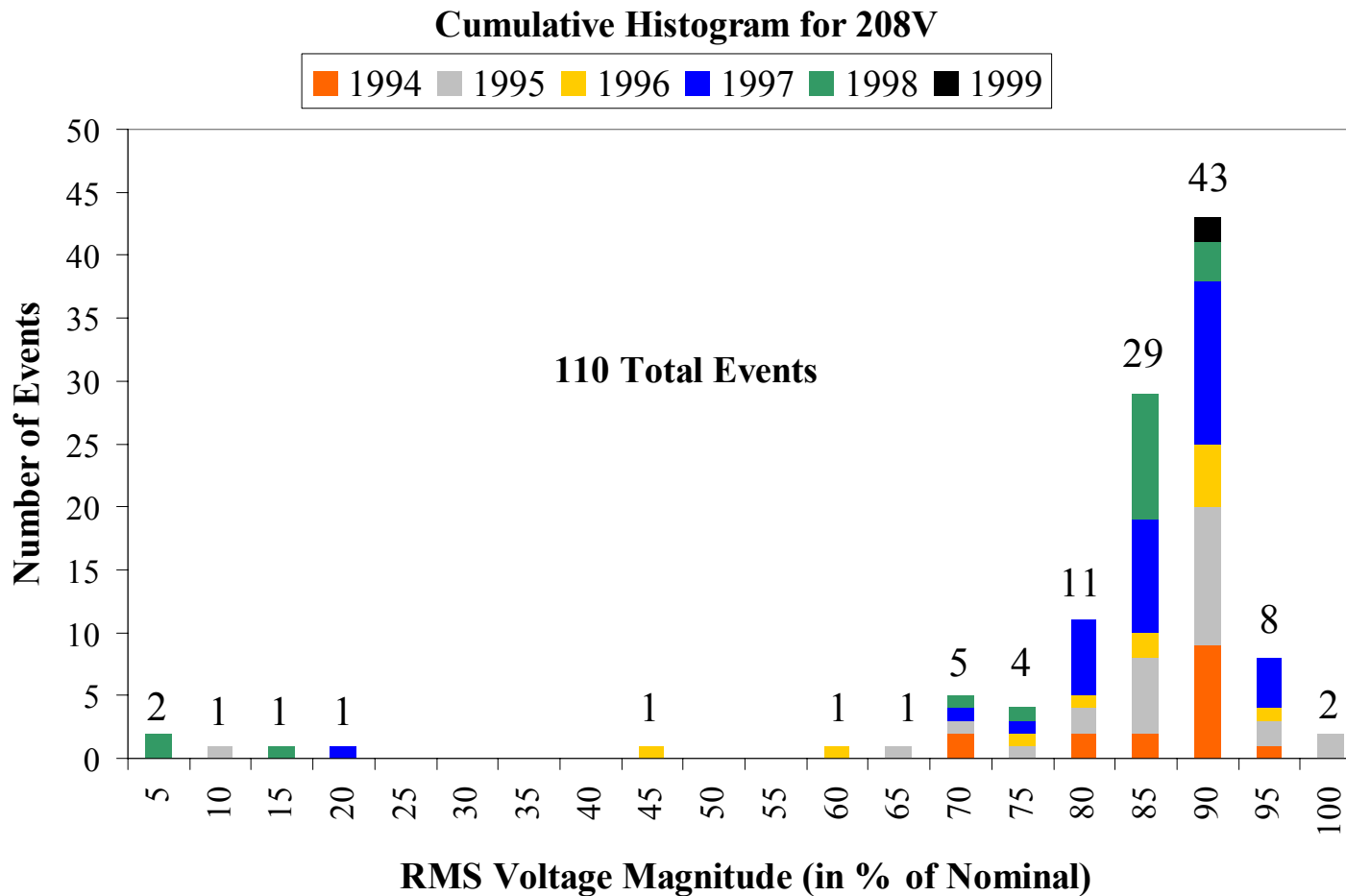
Production Lines

- Line A manufactures 19" CRTs for monitors with provisions for 21"
- Line B manufactures flat panel 19" CRTs for monitors with provisions for 17".
- Pegasus Line manufactures 17" CRTs for PC monitors.
- 32" line manufactures TV CRTs .
- 27" Line manufactures TV CRTs
- 20" Line manufactures TV CRTs.

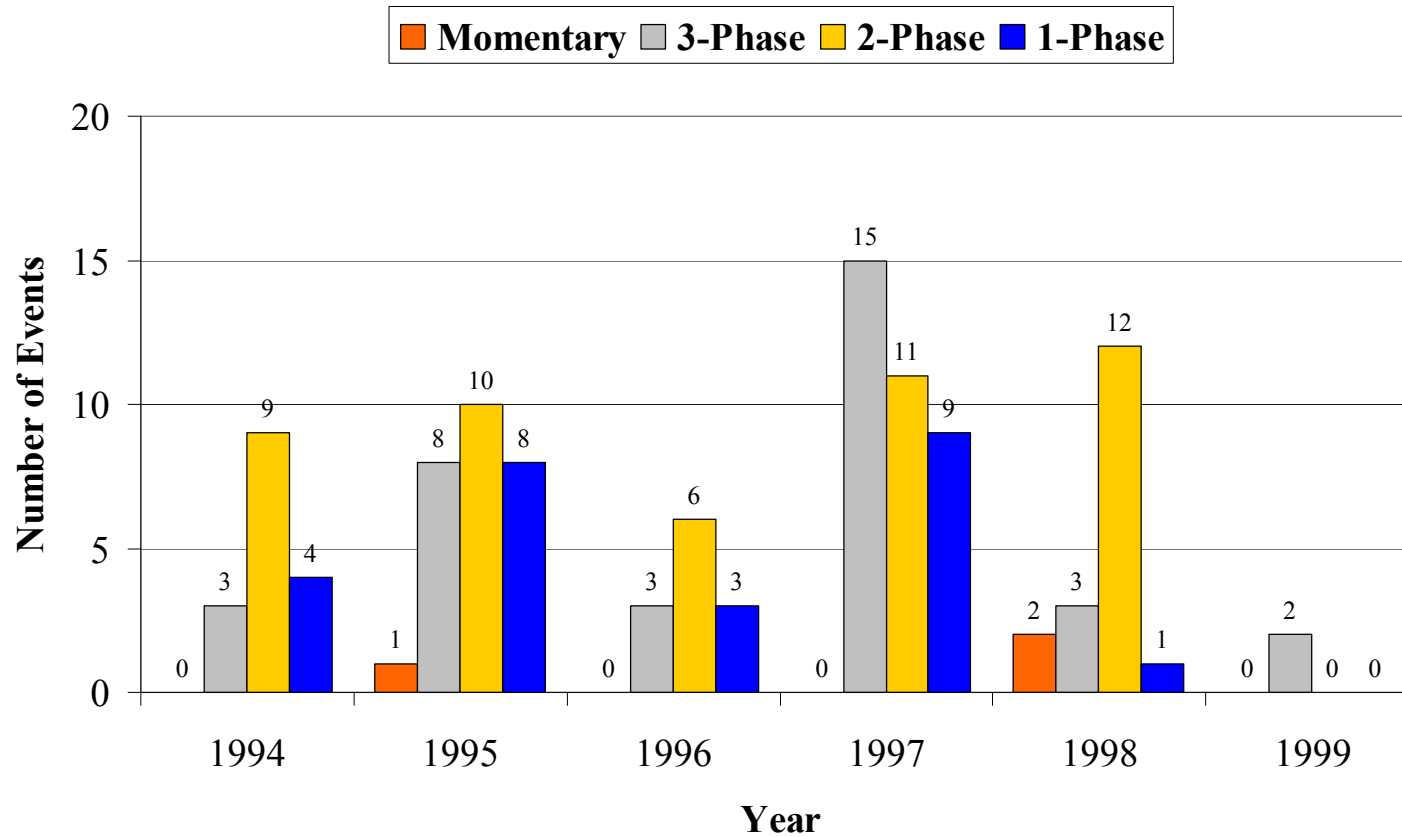
Financial Impact of Three Events

Date	Impact	# of Units Rejected (A)	Downtime in Minutes	# of Units missed due to downtime (based on 28 second Mercury Index time) (B)	Total # of Units missed (A) + (B)	Total Cost (based on \$180 per unit)
11/19/98	Power fluctuation caused CS light houses to trip	30	20	43	73	\$13,140
11/23/98	Power Glitch AG, SCR, PII, Lost all screening	73	48	103	176	\$31,680
01/26/99	Power glitch in screening process	44	10	22	66	\$11,880
Total		147	78	168	315	\$56,700

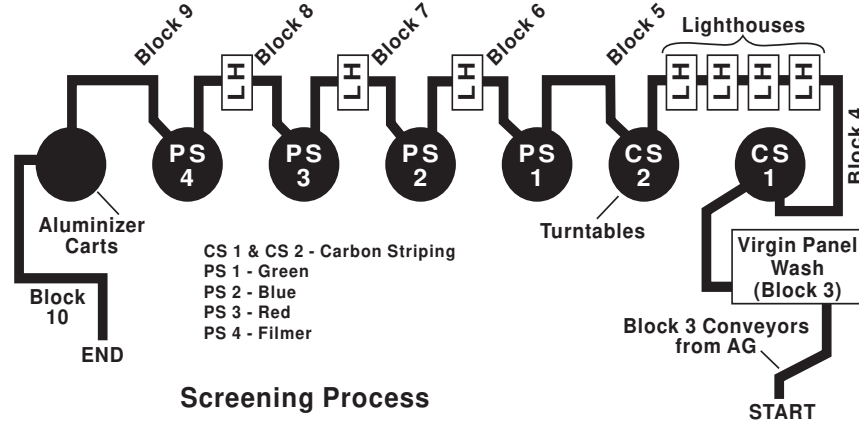
Voltage Sag Characteristics Inside the Plant



Type of Events



Critical Process: Screening

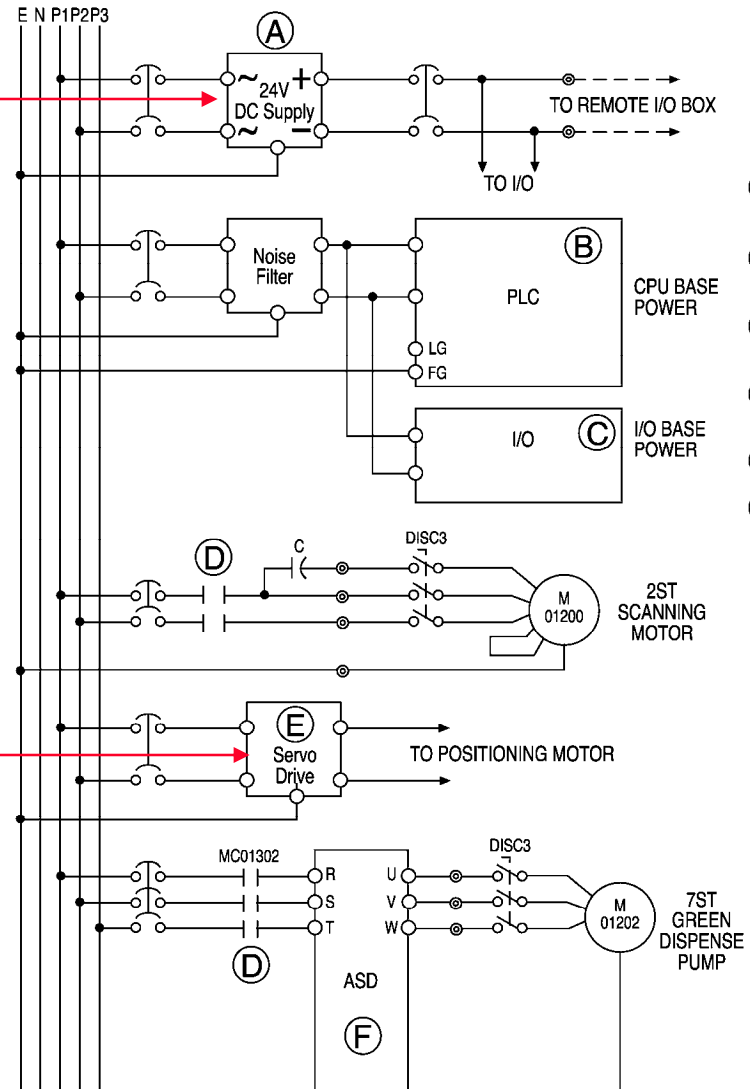


Screening Process

Screening Process Flow Diagram



Sensitive Equipment

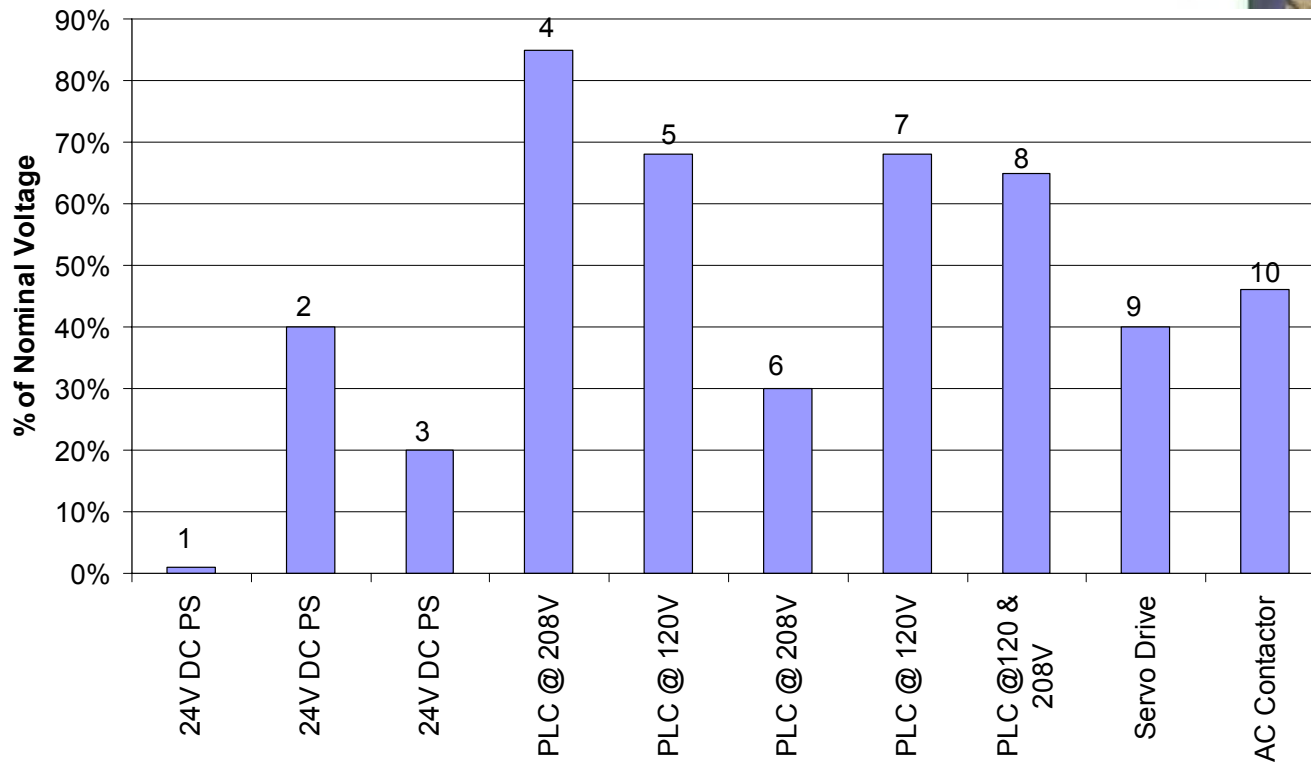


- (A) 24V DC Power Supply
- (B) PLC CPU Power Supply
- (C) I/O Rack Power Supply
- (D) Contactor with AC Coil
- (E) AC Servo Drive
- (F) Three-Phase ASD

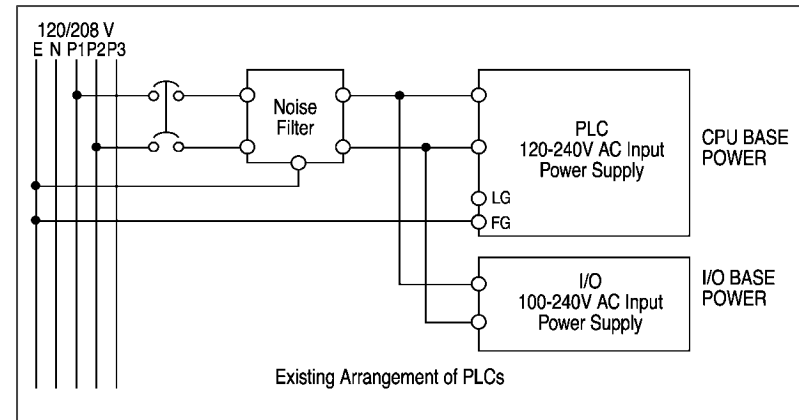
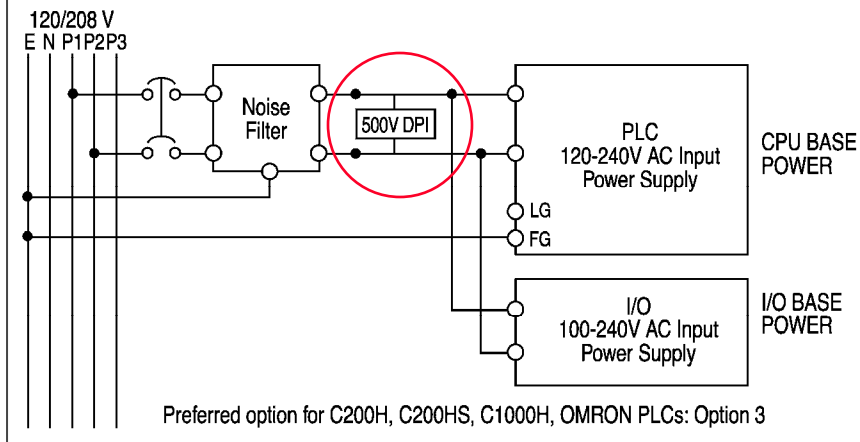
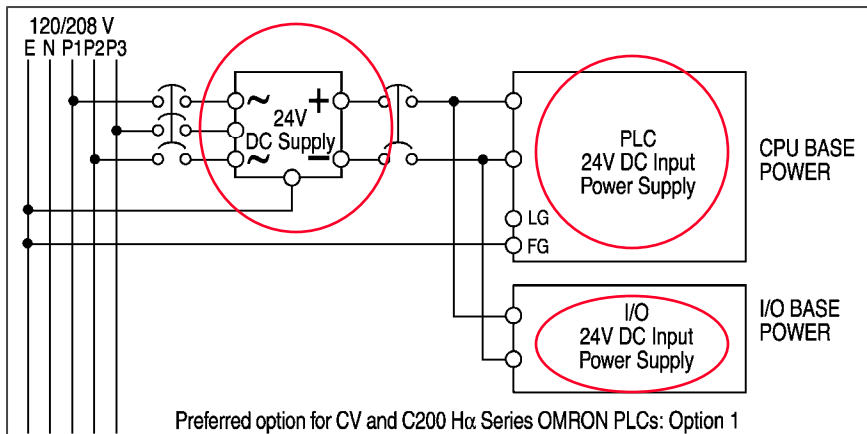
How Sensitive?



(Higher Bar Means More Sensitive)



Embedded Solution



Change PLC Input from AC to DC input.

Use a 3-Phase AC input to 24VDC output Power supply.

If PLC AC power supply is integrated to the Module use a small power conditioning (e.g., Dip Proofing Inverter or CVT).

AC Versus DC Input for PLCs

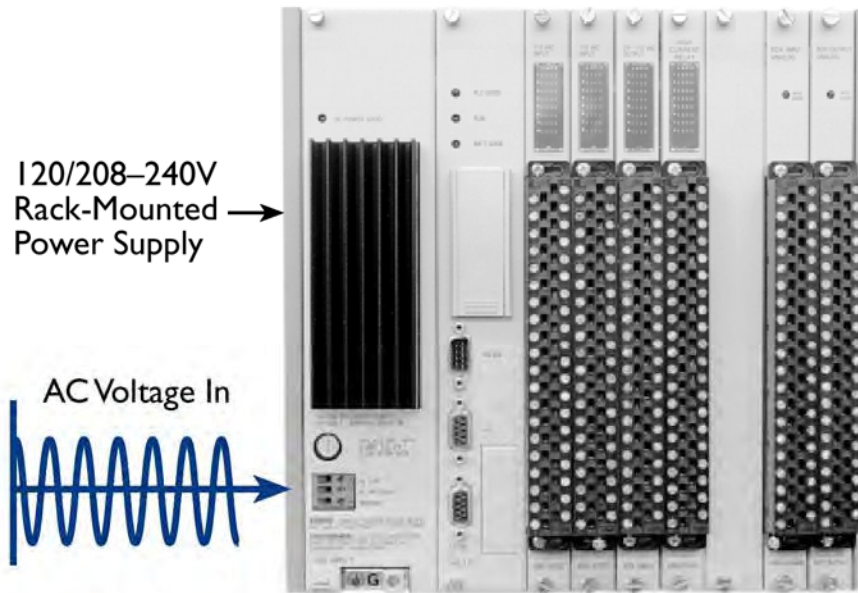


Figure 1. A rack-mounted PLC power supply that requires AC voltage (120/208-240 volts)

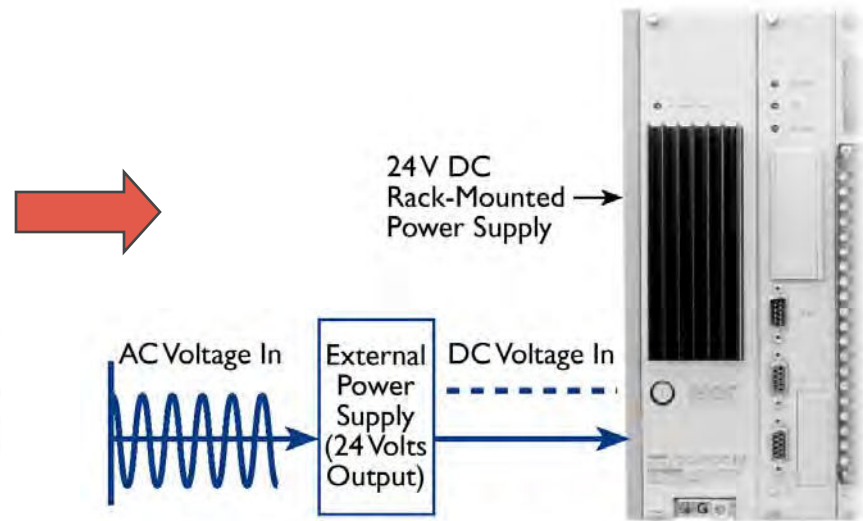
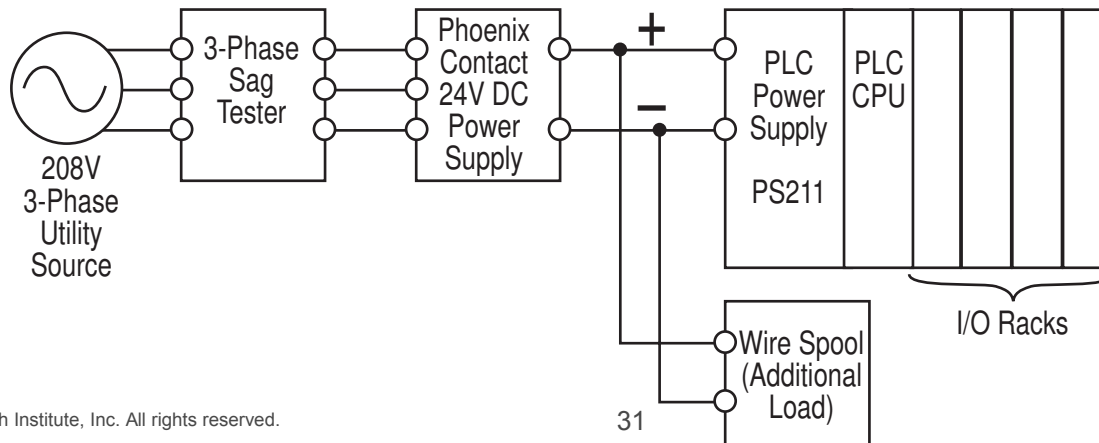


Figure 2. External power supply that provides 24 volts DC to the rack-mounted PLC power supply.

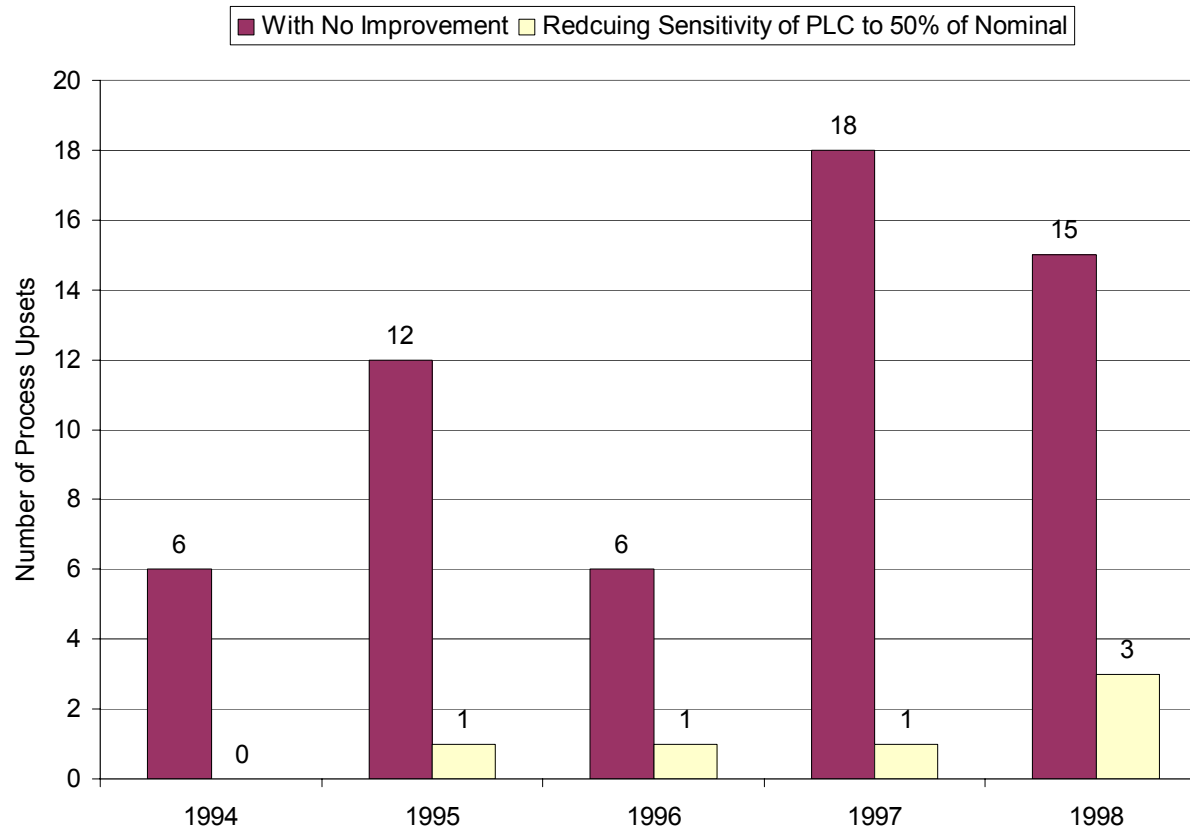
How Effective is a 3-Phase AC Input to 24V DC output Phoenix Contact PS

PLC Power Supply unit	24V DC Source	Loading on 24V DC Source	Voltage Sensitivity Threshold (in %) for 30 Cycle Ride-Through		
			Three Phase Sags	Two-Phase Sags	Single-Phase Sag
CV500-PS211	Phoenix Contact	20% ¹	0%	0%	0%
CV500-PS211	Phoenix Contact	35%	45%	0%	0%
CV500-PS211	Phoenix Contact	60%	50%	0%	0%



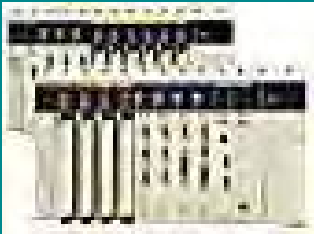



How Effective is this Solution?

Impact of Decreasing Voltage Sag Sensitivity of PLC



Targeted Recommendation Based on PLC Type

	PLC Types	Existing 100-240V AC PLC, I/O Rack Power Supply	Replacement 24V DC Power Supply
	CQM1 (Small Range)	<ul style="list-style-type: none"> • CQM1 PA-203 • CQM1 PA-206 	Not required; Existing power supply can withstand sags down to 30% of nominal voltage
	C200H _α (Mid Range)	<ul style="list-style-type: none"> • PS223 • PS22E 	<ul style="list-style-type: none"> • PA204
	CV Series: 500, 1000, 2000, M1 (Large Range)	<ul style="list-style-type: none"> • CV500-PS221 • CVM1-PA208 • 3G2A5-PS22-E 	<ul style="list-style-type: none"> • CV500-PS211 • 3G2A5-PS212-E
	C200H, C200HS, C1000H (older model PLCs)	Power Supply Integral to CPU Unit	Not available for PLCs with integral power supply; Requires 500VA DPI unit for PLC and I/O Rack power supply

Lessons Learned

- In designing new process lines use DC input controllers wherever possible.
- Use a robust DC source for all your DC inputs (such as, 3-Phase AC to 24V DC power supply)
- Know the sag immunity of your DC power supplies in your plant.



#3) Gypsum Board Manufacturer Experiences Sudden Downtime



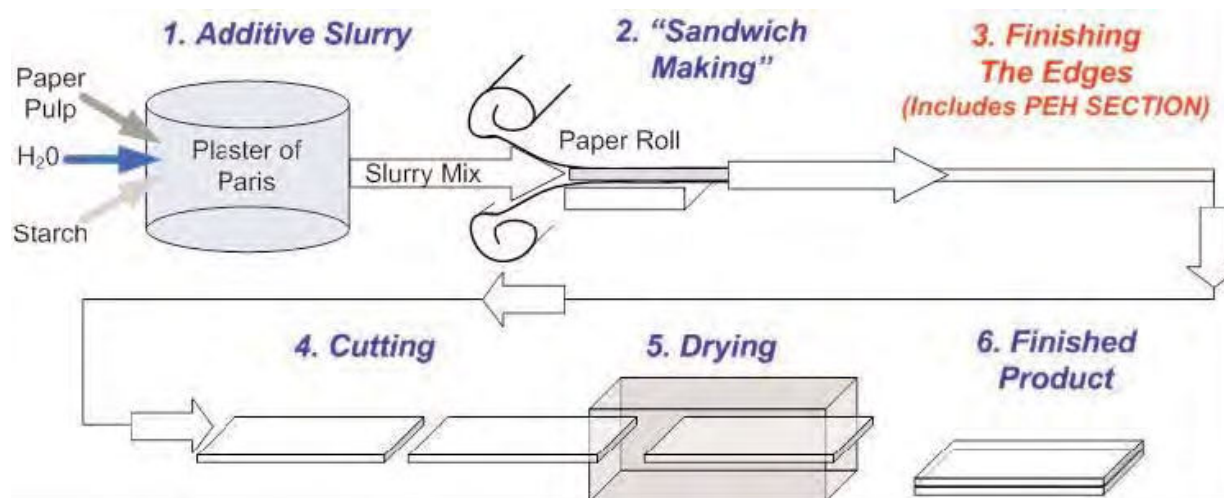
Introduction

- A large gypsum board manufacturer began experiencing voltage sag-related shutdowns in a critical part of its production line related to its paper edge heater (PEH) controls on the front-end of the quarter-mile-long manufacturing line.
- The line had experienced six events in a one-month period that were now shutting down the associated variable frequency drives and controls.
- ***The puzzling aspect of this problem was that this section was not problematic in the past.***
- Working in cooperation with the local utility, EPRI was called in to look at the manufacturing process, determine why these sensitivities were occurring, and offer a solution.



THE MANUFACTURING PROCESS

- In order to make drywall, the gypsum core material must be placed between layers of paper and then dried, finished, and cut into standard sizes.
 - The process takes about 35–45 minutes from initial forming of the sheet in the slurry section to the cutting of the final product to the standard length.
- The manufacturing begins by blending additives together in a slurry. Next the mixture is sandwiched between layers of paper, and edges are formed on the continuous sheet of drywall. It is then cut and dried.
- It was immediately after this initial “sandwich” section that the manufacturer was experiencing shutdowns with the PEH section.



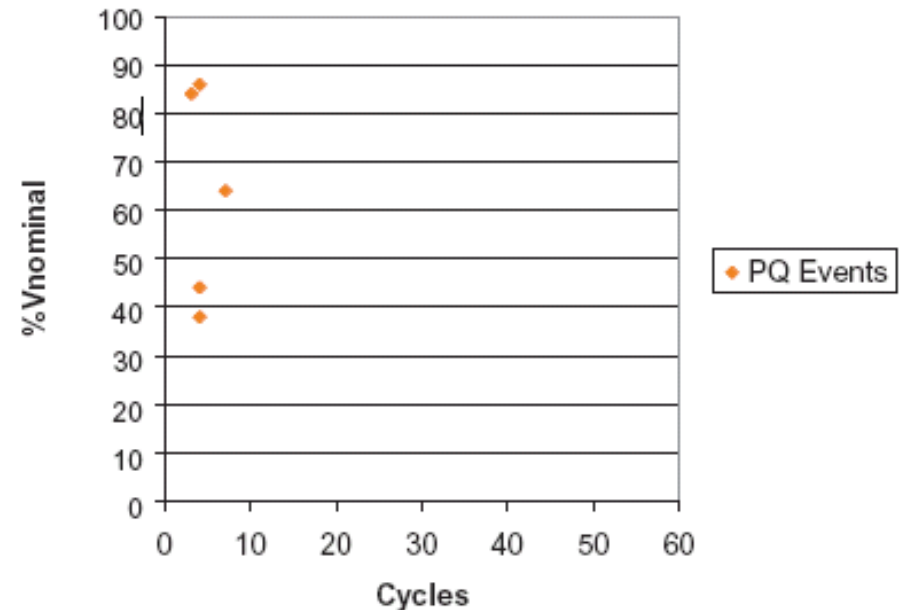
PQ DATA & ANALYSIS

- The plant is fed 161 kV from a local substation, which is stepped down to 4.16 kV for distribution throughout the facility.
- The plant is fed in a wye-wye arrangement. Therefore, the magnitude of the voltage on the 161-kV side will translated directly to the 4.16-kV side.
- The utilization voltage in the plant is stepped down to 480 Vac by other transformers, which are delta-wye in configuration.
- The utility had power quality monitoring data from nearby substations, not right at the plant.
- The data from the closest substation was used, which was located about 2.5 miles from the gypsum plant's 161/4.16kV service entrance transformers.

Five PQ Events Recorded at Nearby Substation

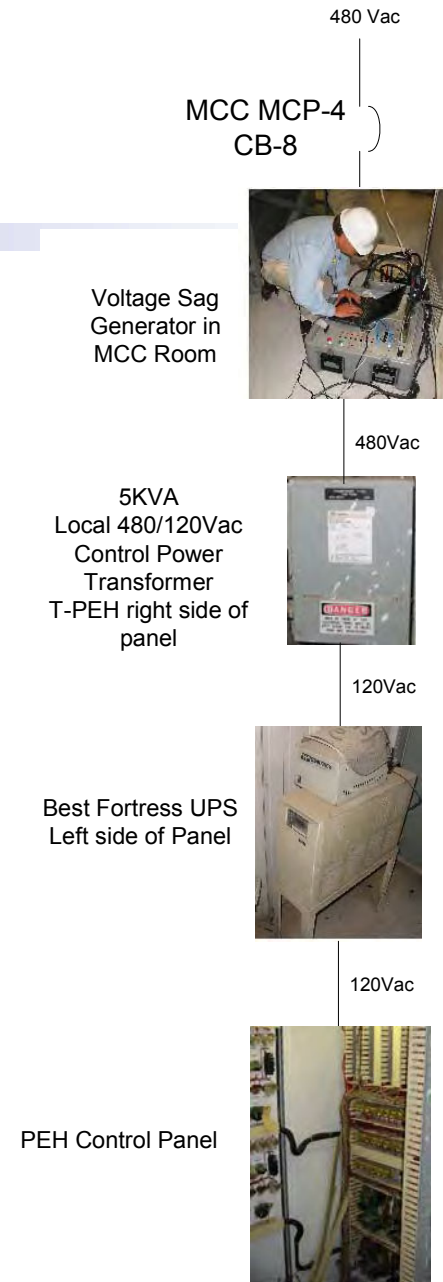
Date/Time	Event Description	Magnitude (per unit)	Duration (cycles)
2/21/05 3:12:53	Phase C voltage sag	0.64	7
2/21/05 5:48:06	Phase C voltage sag	0.43	4
2/21/05 5:48:07	Phase C voltage sag	0.38	4
2/21/05 17:10:13	Phase B voltage sag	0.86	4
3/27/05 15:52:30	Phase A voltage sag	0.84	3

Magnitude-Duration Plot for Five Recent PQ Events Recorded at Nearby Substation



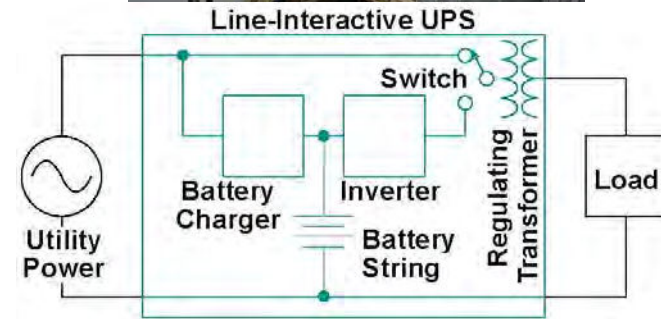
PEH Control Panel Test Setup

- Conducted Voltage Sag Tests from nearby MCC room.
- Due to distance, used a local Dranetz meter setup to trigger on the voltage sag at the panel. Communicated by phone.
- Tests Conducted such that voltage sags were induced on the front end of the UPS that is supporting the control cabinet load.
- Started Tests at 90%, 6 cycles and decreased in 5% increments until trip.
- Continued until controls were found to trip.



PEH Control Panel

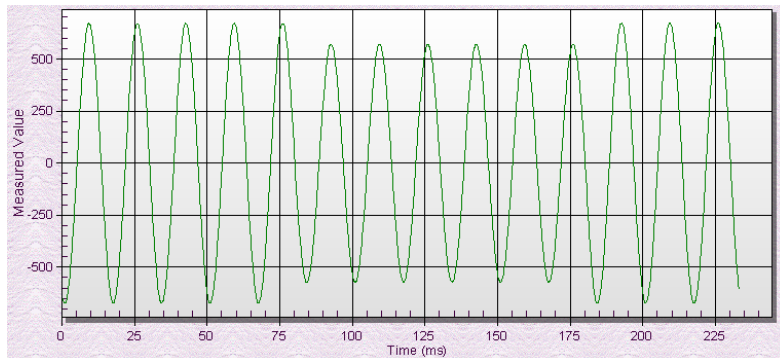
- PEH Control panel includes many relays, contactors, and six burner control units.
- Interfaces to separate PLC and Drive via hardwired connection.
- Control voltage supported by a line-interactive UPS.
- A local line conditioner abandoned in place (not used) that was previously for a printer.
- Very dusty environment



PEH Control Panel Test Results

- Control Panel was found to shutdown for an 85% of nominal, 6 cycle voltage sag!
- UPS switched in during voltage sag but was not able to support load for **more than 2 cycles.**
- Process line was upset and had to be restarted.

Voltage Sag Output

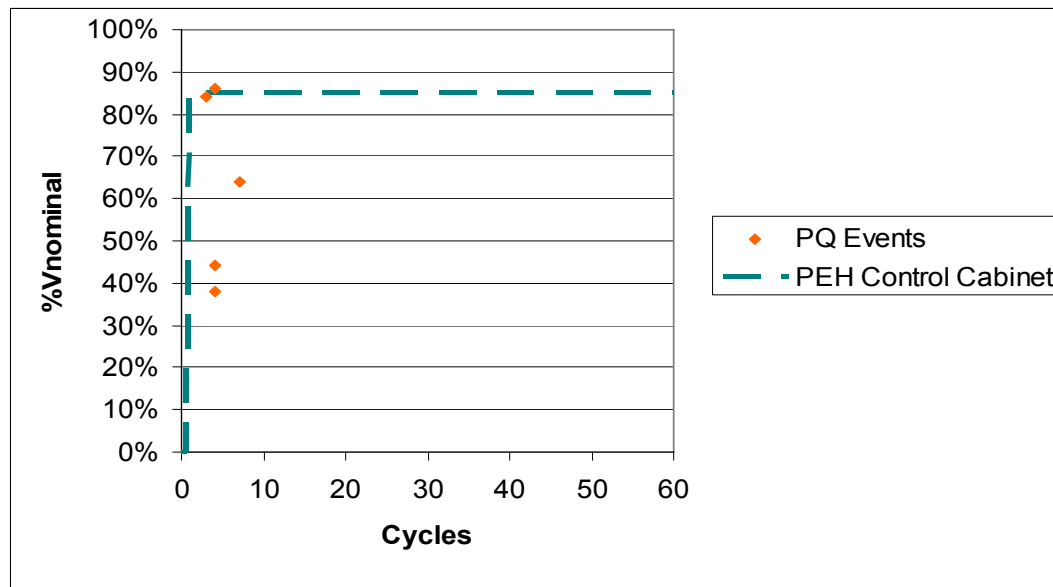


UPS Output



Expected PEH Panel Shutdowns from Recent Historical Data

- With the UPS malfunctioning, it is not surprising that all of the recent voltage sags seen at the plant had upset this panel.

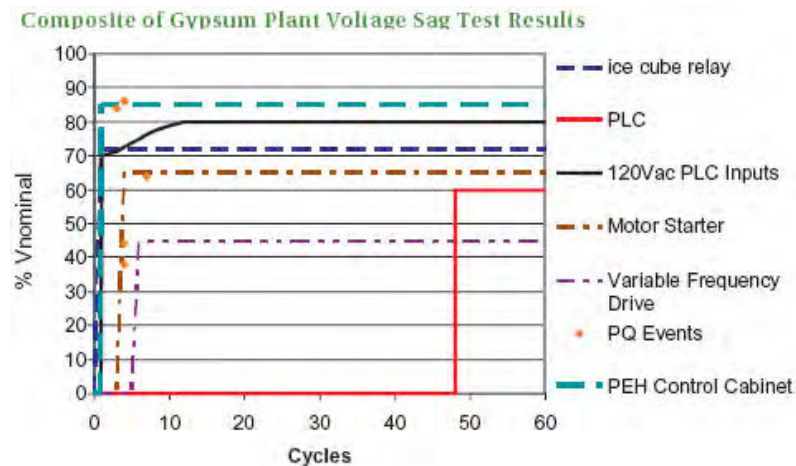


Why did UPS Fail?

- ***The UPS did not show any external signs that there were any operation problems.***
 - The Best Fortress is a line-interactive UPS with tap changer.
 - Voltage is normally passed directly through to the output.
 - The line-fault detection circuit continuously monitors the input and during an outage will seamlessly transfer to inverter (battery power).
 - This inverter is very fast and can actually correct input voltage on a sub-cycle basis.
 - Also located inside is an autotransformer with a boost tap. When a voltage sag appears, the unit will transfer to inverter, change from the nominal to the boost tap, then transfer back to utility power. This is what appears to have happened in this case.
- Theory 1: The boost tap is not working. One reason for this could be a blown fuse on the boost tap. We are not sure if the relays are sealed or not, if not then the dusty environment may have effected the relay. Perhaps a good vacuuming is needed.
- Theory 2: There is a welded relay contact caused a fuse to blow. This seems to be supported by the high frequency pulse near the peak of the first negative half cycle in the plot, which could be due to a shorted turn between the normal and boost taps with the nominal tap winning (the boost tape fuse blows first). Then, near the peak of the second negative half cycle, which starts out looking good on inverter, the UPS transfer to the boost tap and the output collapses.

Other Tests

- Other tests were performed on the associated variable frequency drive, programmable logic controller (PLC), relays, and contactors.
- From the power quality data, it is clear that the malfunctioning UPS that powers the PEH control cabinet was the most significant impact.
- This is followed by the high susceptibility of the 120-Vac input cards, and the various 120-Vac “ice cube” style relays used in the control systems and the motor starters.
- Surprisingly, the most robust sections of the control system are AC variable frequency drives and the PLC rack power supplies.



RECOMMENDATIONS

To make the PEH system more robust to voltage sags, the following recommendations were provided:

1. The UPS used to support the PEH control cabinet must be replaced. The malfunctioning UPS will drop out for voltage sags of 85% of nominal or less, leading to a shutdown of the PEH controls.
 - A new UPS or properly sized CVT would be effective. The estimated cost of the CVT is US\$1200.
2. Power conditioning should be provided for both the PLC power supply and the control voltage used by the I/O circuits.
 - In the current scheme used at the facility, only the PLC power supplies are protected by power conditioning.
 - Without power conditioning on the I/O and control power, the controls will remain susceptible.
 - The budgetary cost should be from \$1200 to \$2500 per each CVT installation.
3. The plant uses many variable frequency drives of the same model that was tested.
 - In order to maximize the driver performance, it was recommended that drive momentary power loss parameters be enabled.



CONCLUSIONS

- The gypsum plant experienced a sudden downturn in the ability of its process systems to ride through voltage sags.
- Specifically, the PEH control area began tripping off-line where it had been historically more robust.
 - Testing and analysis of the related controls revealed that the UPS was not functioning properly even though it showed no external signs of a fault condition.
- This case study reveals a common issue with small UPS systems that begin to malfunction.
- In this case, bypassing the UPS would have allowed the line to ride through two of the power quality events in which it actually shut down.
- ***When new power quality problems begin to arise on an existing system, a malfunctioning power conditioner should be considered a likely scenario.***



#4) Power Quality Investigation of a Manufacturing Plant



Introduction (1)

- A manufacturer's plant had experienced a series of equipment and process downtimes in the second half of 2005 as a result of power quality problems.
- The basic purpose of the power quality audit was to evaluate the most sensitive equipment in the plant and formulate the best approaches that could be taken for hardening the equipment to voltage sags and momentary outages.
- The power quality audit was accomplished by inspecting drawings, doing on-site testing, physically examining the plant equipment and specifications, as well as analyzing plant power quality data.
- The facility contained five critical product lines, numbered as Process Lines 1 through 5.
 - All five product lines were susceptible to PQ disturbances, most notably voltage sags.
- In addition to the product lines, several other areas were vulnerable to voltage sags, including boiler systems, air compressors, conveyor controls, as well as the computer control areas.

Introduction (2)

- Three process lines (1–3) are used as the prime examples for this case study.
- Process line 2 uses an Allen Bradley programmable logic controller (PLC), which is fed by a small, local uninterruptible power supply (UPS).
 - The controls also contain several National Electrical Manufacturers Association (NEMA) style starters as well as six TB Wood's E-trAC drives.
- In addition, one of the sub panels is powered by a generator that controls four small 120-Vac motors that are use to pull the product out of the oven if the power is lost.
 - This control requires that the PLC remain on-line (via UPS).
 - The PLC operates the small motor starters using generator power through the output card to turn on the motor starters.

Process Line 2 Controls



PLC remote I/O racks, burner controls, numerous AC "ice cube" relays

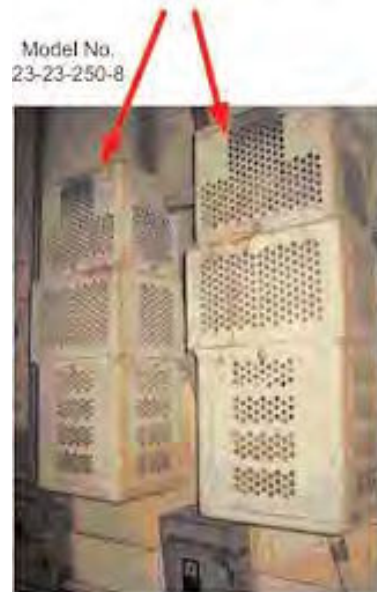


Drive racks

Process Line 4 and 5

- Process Line 4 and 5 each use a 5-kVA constant voltage transformers (CVT) to provide conditioned power to only a few of the control cabinets.

Two 5kVA Sola CVS Series CVTs (for Process Lines 4 & 5)

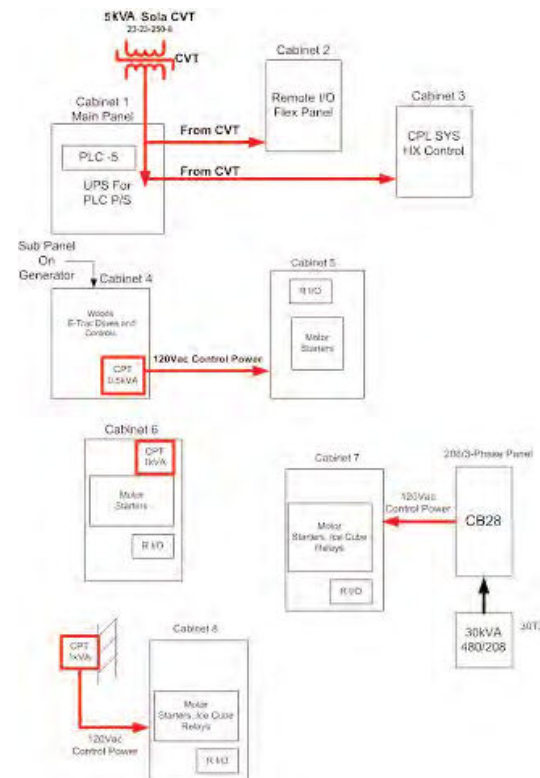


CVT for Process Line 4 Loading

Single Phase Readings - 12/15/05 14:08am			
Summary Information		Voltage	Current
Frequency	59.96	RMS 116.32	4.63
Power		Peak 158.08	9.27
KW	0.56	DC Offset -0.26	-0.05
KVA	0.54	Crest 1.36	1.99
KVAh	0.10	THD rms 5.08	28.10
Peak KW	1.47	THD Fund 5.09	30.41
Phase	117° lag	HRMS 5.91	1.35
Total PF	0.94	KFactor 4.13	
DPF	0.98		

CVT for Process Line 5 Loading

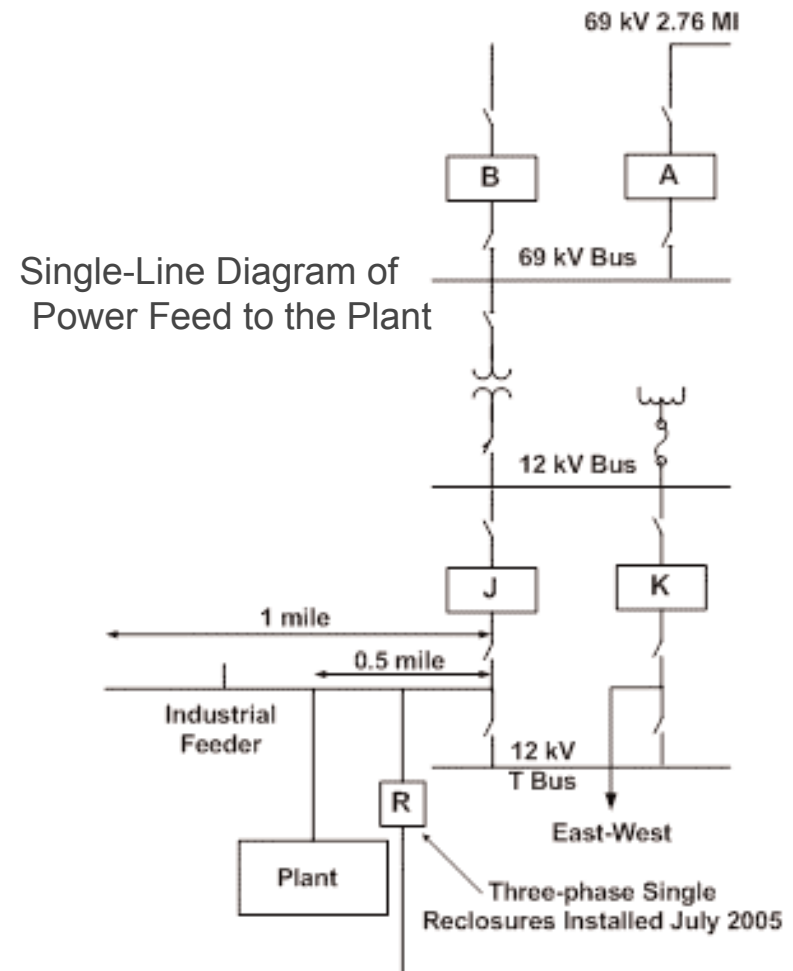
Single Phase Readings - 12/15/05 14:20:14			
Summary Information		Voltage	Current
Frequency	59.96	RMS 116.08	4.72
Power		Peak 156.12	9.67
KW	-0.51	DC Offset -0.26	-0.04
KVA	0.55	Crest 1.34	2.05
KVAh	0.09	THD rms 5.24	31.85
Peak KW	-1.51	THD Fund 5.25	33.60
Phase	170° lead	HRMS 6.08	1.50
Total PF	-0.92	KFactor 4.52	
DPF	-0.99		



Process Line 4 Control Power Sources and Routing

Power System Overview

- Plant is supplied from a 12-kV industrial feeder.
 - Derived from a 69-kV substation
- Plant is located approximately 0.5 miles from substation.
- Three single-phase reclosers were added on a lateral upstream circuit in July 2005, which should increase the power quality as seen by the manufacturer.



PQ Data and Analysis (1)

- The utility reported events during the time frame from June 25, 2005, through December 2, 2005.
 - These events are tabulated and plotted on the following slide.
- If the equipment in the plant were compliant with the SEMI F47 power quality standard, then only 9 out of 20 events would have affected the plant.
- Furthermore, if the equipment could survive voltage sags down to 30 percent of nominal for 1 second, then only **one** out of 20 events would have affected the plant
 - Squirrel fault (December 1, 2005, 200-cycle Interruption)

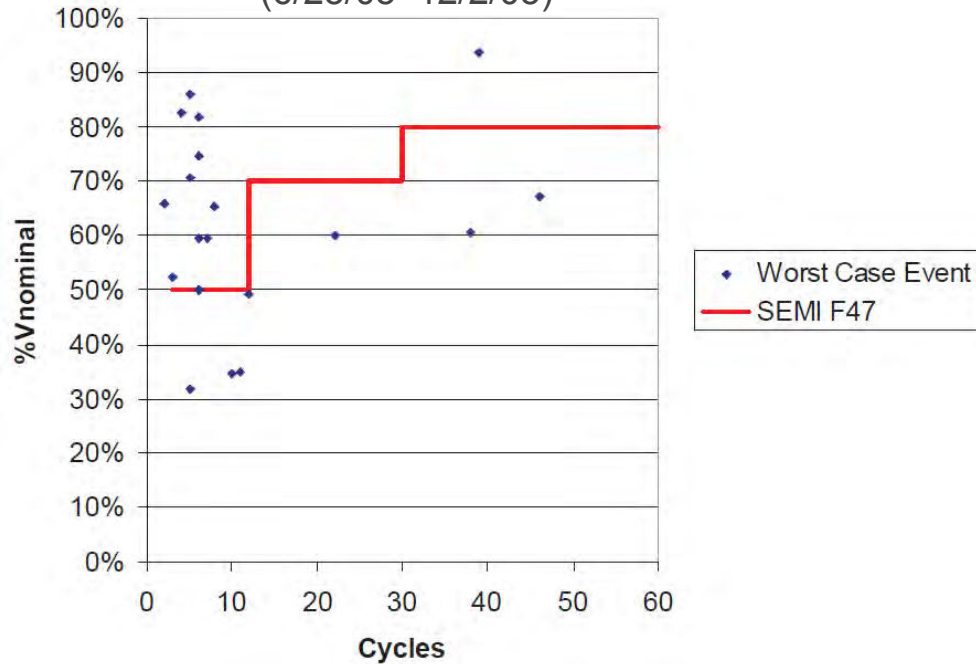


PQ Data and Analysis (2)

Summary of Power Quality Attributes for PLCs and AC Drives

Date	Sag Duration (Cycles)	Worst-Case Magnitude of Event	Cause
6/25/2005	2	66%	Storm in area, 69 kV lockout, wire down
6/25/2005	6	75%	Storm in area, 69 kV lockout, wire down
6/28/2005	5	86%	Storm in area (lightning), capacitor bank alarm
7/22/2005	10	35%	Storm in area (lightning)
7/22/2005	11	35%	Storm in area (lightning)
7/26/2005	7	60%	Storm in area (lightning), fuses blown on East West Circuit
7/26/2005	8	65%	Storm in area (lightning), fuses blown on East West Circuit
8/5/2005	5	32%	Storm in area (extreme lightning)
8/5/2005	6	59%	Storm in area (extreme lightning)
8/10/2005	6	82%	Storm in area (lightning), trip 69-kV line
8/10/2005	39	94%	Storm in area (lightning), trip 69-kV line
8/13/2005	3	52%	Storm in area (lightning)
8/13/2005	5	71%	Storm in area (lightning)
8/20/2005	38	61%	Storm in area (lightning)
8/20/2005	46	67%	Storm in area (lightning)
8/22/2005	12	49%	Connector failure on 12-kV circuit
8/22/2005	22	60%	Connector failure on 12-kV circuit
11/27/2005	4	83%	Unknown (subtransmission fault cleared itself)
12/1/2005	200	0%	Squirrel in customer substation
12/2/2005	6	50%	Tree contact with 69-kV line
12/2/2005	8	50%	Reclosing to try and find fault

Plant PQ Data Versus SEMI F47 (6/25/05–12/2/05)

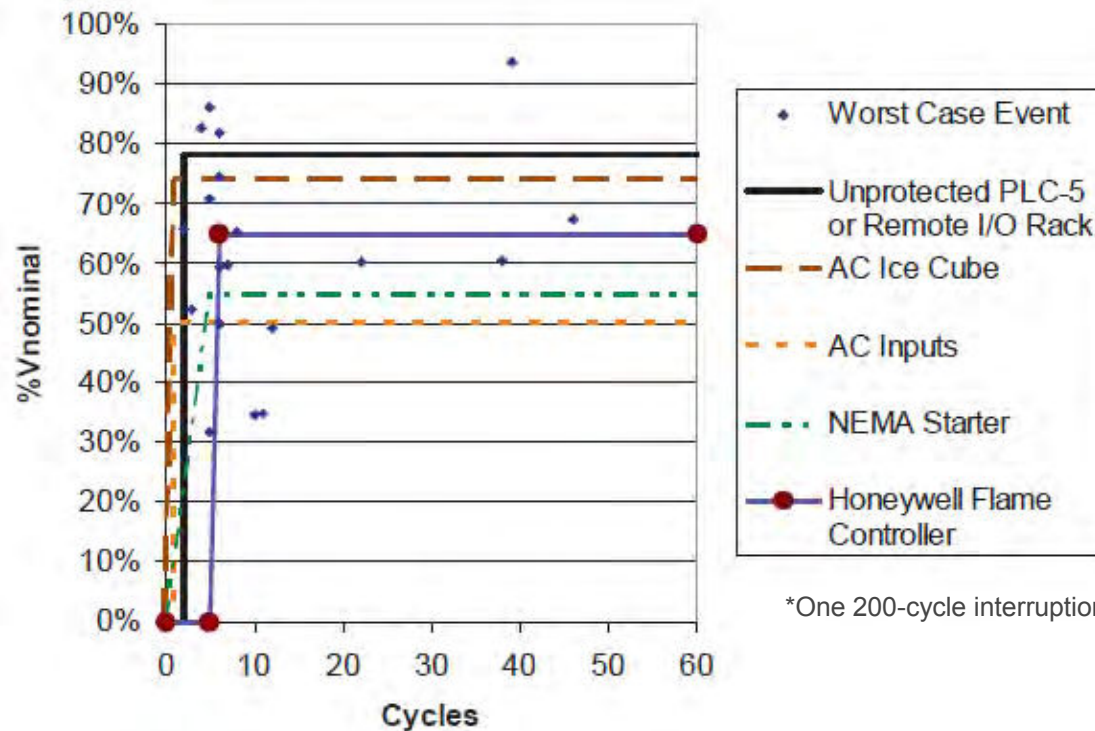


*One 200-cycle interruption not shown

PQ Data and Analysis (3)

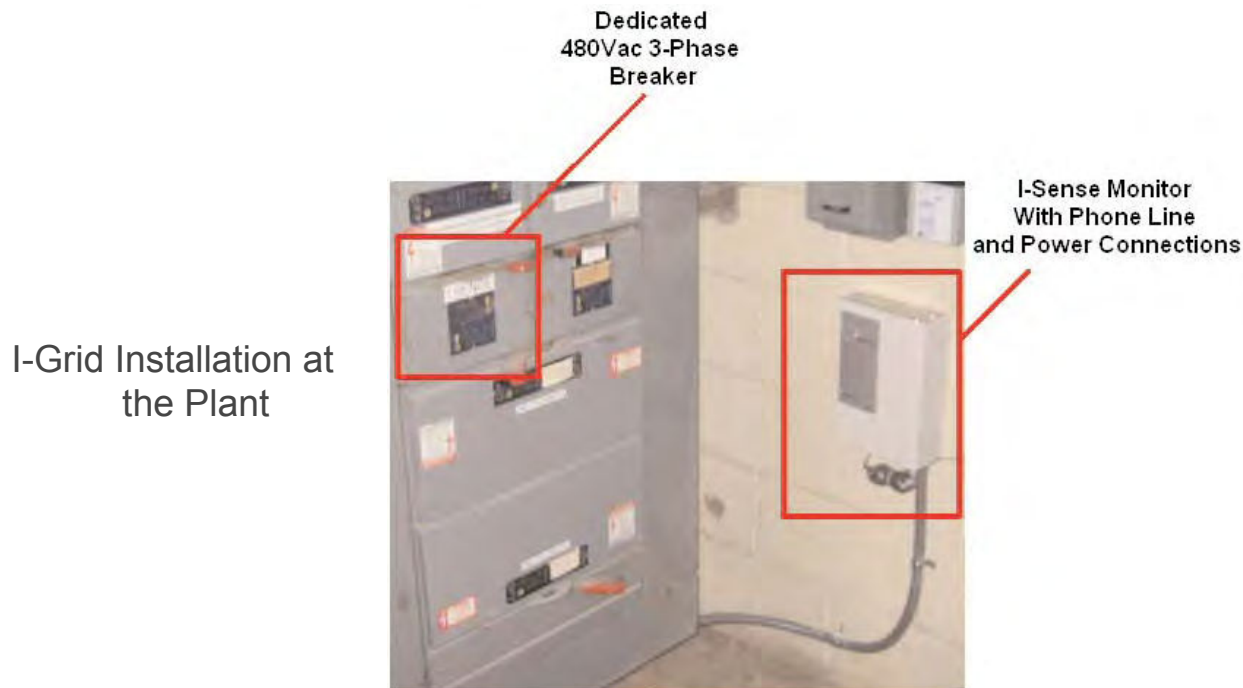
- Based on the equipment used in Process Lines 2 and 3 and the results from previous EPRI tests, it is possible to create an expected ride-through curve.
 - Process Lines 2 and 3 would be expected to survive only 5 of the 22 recorded events based on its configuration.
 - This worst-case estimate assumes that voltage sags always occur on the most vulnerable phase.

Expected Response of
Process Lines 2 and
3 to Voltage Sags



PQ Data and Analysis (4)

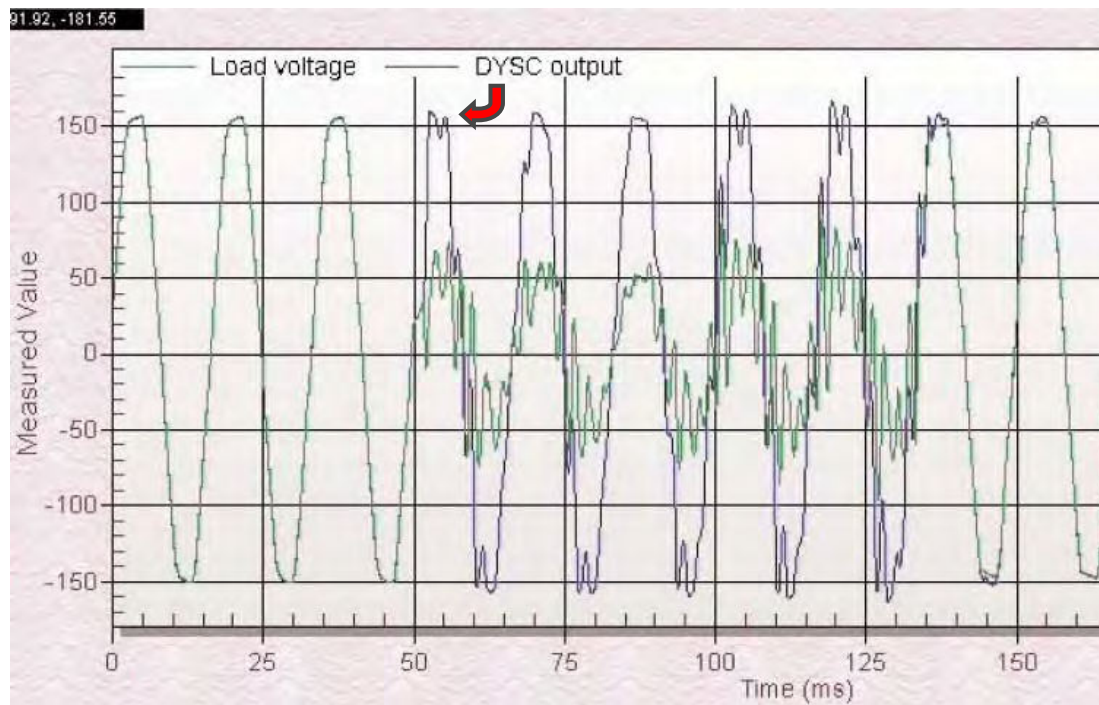
- As a part of this project and recommended by EPRI, an I-Grid power quality monitor has been installed by the manufacturer.
 - Connected to a 480-Vac bus in the generator room.
- The I-Grid has been monitoring power quality information since it was installed on December 14, 2005.



Analysis of Plant Susceptibilities (3)

- The final tests involved using a 1.5-kVA MiniDySC power conditioner on the control loads.
- With the dynamic sag corrector (DySC) installed, the cabinet controls survived a 30-cycle interruption before shutting down.

MiniDySC Product
Compensated
for Voltage Sag



Summary of Plant Analysis

- The audit revealed that several pieces of equipment had control power sourced from control power transformers (CPTs) or through ice-cube relays, both of which are very susceptible to sags.
- Moreover, the analysis showed that a UPS is not necessarily an effective solution as both a bad and/or slow UPS could result in line trips.
 - A better solution would be to provide a voltage ride-through solution or an active sag corrector, as demonstrated during the tests.

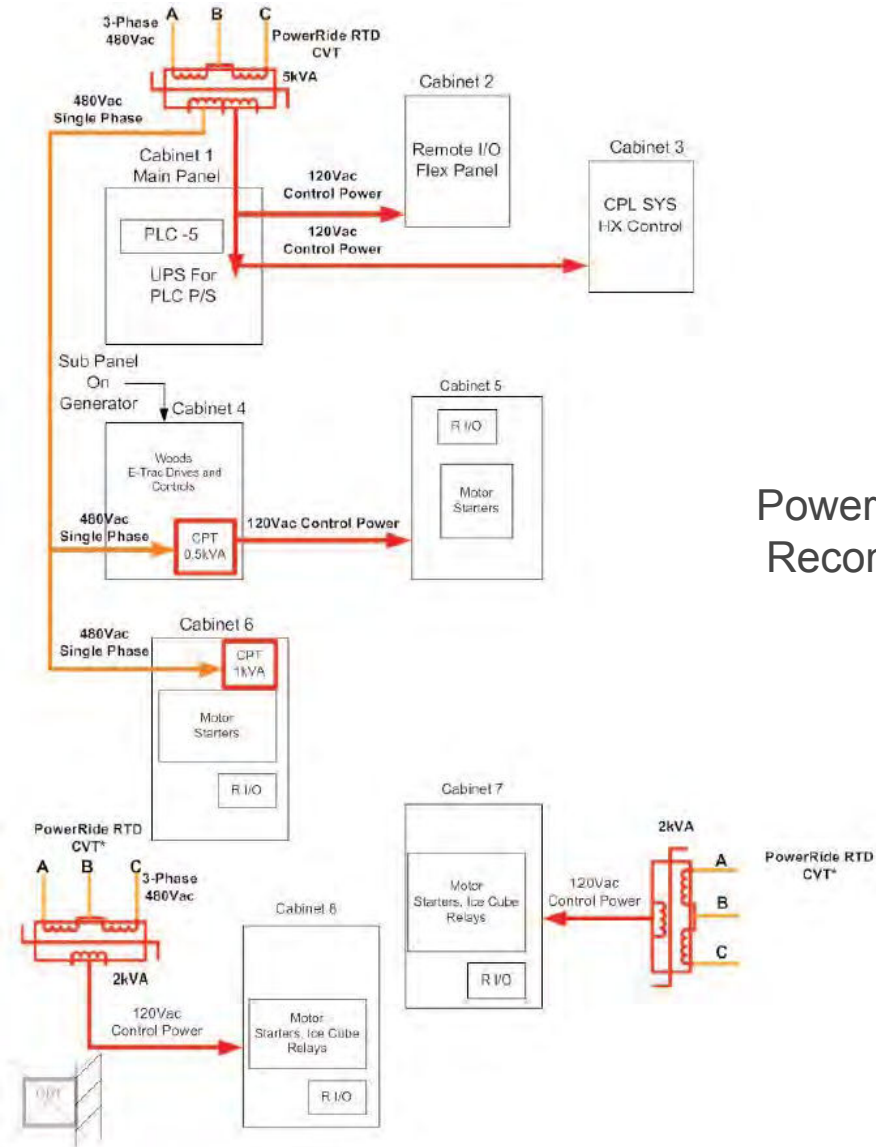
Recommendations

- Based on the results of the analysis, several recommendations were made to improve the plant response to voltage sags such as:
 - Power Conditioners
 - Consolidation of Loads
 - Adjusting Control Parameters

Power Conditioners (1)

- The product lines are spread out with control racks in various locations.
- Ideally, one larger power conditioner would be best; however, with the spread out arrangement, several separate power conditioners may have to be used.
- One recommendation is to use the PowerRide ride-through device (RTD) at appropriate locations.
 - For example, Process Line 4 would need three of these.
 - The first unit would be wound to have both 120-Vac and 480-Vac outputs. The 480-Vac output section will feed the existing CPTs (estimated not to exceed 2.5 kVA), while the 120-Vac output can feed the 120-Vac loads (estimated not to exceed 2.5 kVA).
 - The other two units would be installed in or near the cabinets and are rated at 2 kVA each.

Power Conditioners (2)



PowerRide RTD
Recommendation

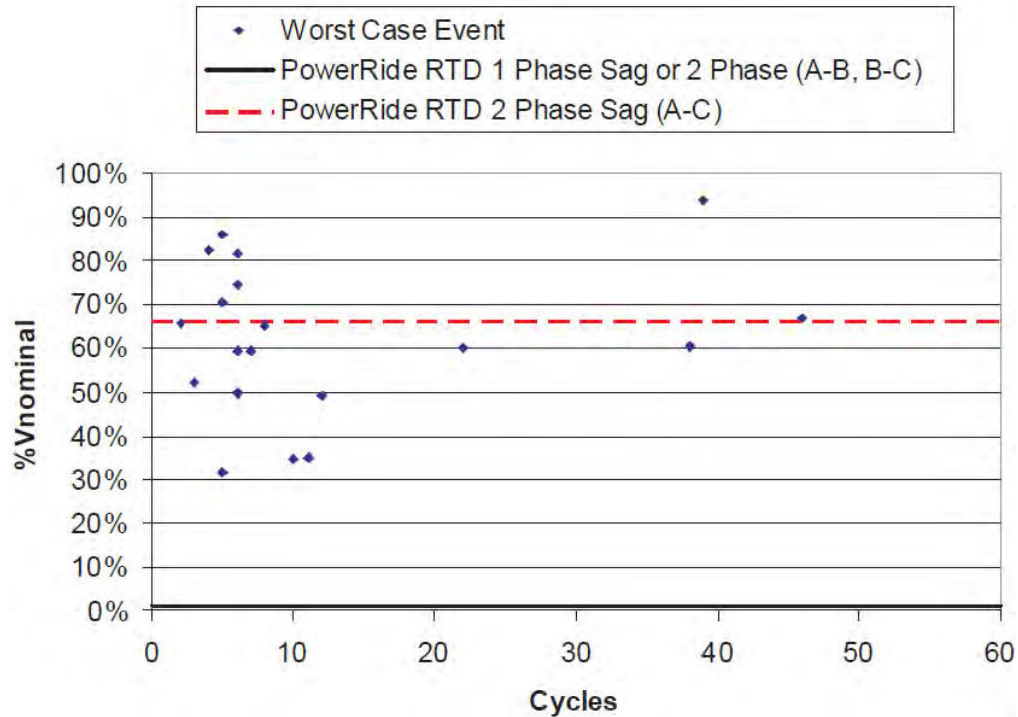
Power Conditioners (3)

- The PowerRide RTD is basically a three-phase input, single-phase output CVT.
 - Allows the controls to survive single-phase voltage sags and momentary interruptions.
 - For events as severe as momentary interruptions on phases A-B and B-C, the output remains at 100% as long as Phase A-C remains at 66% or more.
 - For voltage sags on phase A-C, one expects a typical CVT response with the voltage dropping off at about 50% of nominal or less.

Power Conditioners (4)

- Given the response of the unit, it is likely that only the one momentary interruption event would have affected the process if this unit were installed on the controls.

Expected Voltage Sag
Response of
PowerRide RTD
Power Conditioner

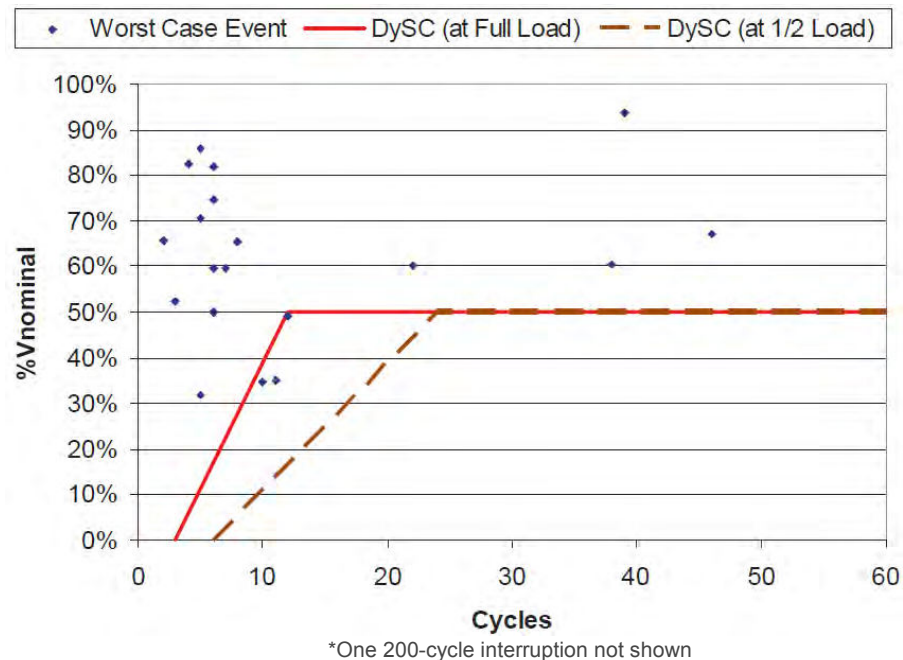


*One 200-cycle interruption not shown

Power Conditioners (5)

- Another option would be to use multiple DySC products.
- It is likely that the units in the plant would only be lightly loaded, therefore pushing the voltage sag ride-through closer to the half-loaded line.
- All but the one momentary interruption would be protected.
- With the use of any of these power-conditioning equipment, the UPS can be removed.

Expected Voltage Sag Response of DySC Power Conditioner



Consolidation of Loads

- Several loads in the plant are dispersed all over the place
- These loads can be combined together as several panels are only lightly loaded.
- Such a consolidation would allow more effective use of power-conditioning equipment.

Adjusting Control Parameters

- It is recommended that the adjustable-speed drives be set up for the best voltage sag ride-through performance possible.
- This would allow the adjustment of voltage trip points as well as enabling any voltage sag ride-through features that may have been inherently built into the drive.

Magnatek GPD 305

- When a fault occurs during operation, the GPD drive can be programmed for auto-restart using parameter **n47**.
- The setting of this parameter either enables or disables the ride-thru feature of the GPD 305. The three settings are:
 - 0 = Disabled (Factory setting)
 - 1 = Enabled with a 2 sec ride-thru
 - 2 = Enabled with indefinite ride-thru, provided the control power is maintained.
- When set to "0" there will be no ride-thru available
- If enabled, the 305 will continue to operate during a momentary power loss of up to 80%, but if the loss exceeds the identified time period, the 305 will stop.



Implementation Results (1)

- The plant ultimately decided to deploy the PowerRide RTD technology as the solution.
 - Familiarity of the constant voltage transformer to the maintenance staff played a key role in the decision.
- When the product was installed, a few initial problems were encountered related to matching the peak voltage output of the larger size power-conditioning units with the required peak voltage input for the PLCs.
 - From a root-mean-squared standpoint, the voltages matched.
 - The peak voltage requirement of the PLC was higher than the output of the conditioner.
 - The power conditioning provider and the manufacturer found a workable solution to boost the output to an acceptable level.
- Subsequently, the power conditioner manufacturer changed the design for future builds of the larger power conditioner to provide a higher peak voltage to avoid a reoccurrence in future installations.

Implementation Results (2)

- The plant estimated yearly losses in the \$300,000 range due to downtime induced by problems related to power quality.
- Since installation of the recommendations in early June of 2006, the site experienced a total of 103 events as reported by the I-Grid system.
- Of those events:
 - 6 were outages that were mostly weather related
 - The remaining 97 recordings were aggregated into a subset of 40 actual events.
 - Of those 40 events, 18 to 19 would have shut the plant equipment down based on the previous history and the expected vulnerability of the unprotected equipment.
- However, none of the voltage sag events were found to affect production after the installation of the solutions.

Conclusions (1)

- A detailed PQ audit of the plant revealed several controls on the process lines were vulnerable to voltage sags.
- Based on the recommendation of EPRI, the manufacturer purchased an I-Grid monitor, which was remotely set up and configured by EPRI.
 - The plant quickly realized that unless you can see the PQ data, you cannot correlate the process vulnerabilities and the effectiveness of any installed solutions.
 - The installation of the I-Grid system provided valuable data that served to enhance the recommendations put forth for improving power quality response of the plant's manufacturing lines.

Conclusions (2)

- It was determined that providing conditioned power to the controls would significantly improve the tolerance of the process lines to PQ-related problems.
- Individual power conditioners were recommended; however, a consolidation of several of these loads to a common point of coupling can alleviate the need for multiple power conditioner units.
 - The latter approach would be significantly less expensive.
- Among the various types of power conditioners available, the PowerRide RTD and the DySC were proposed as viable choices.
 - The RTD was selected by the plant and installed.
- Besides power conditioning, the plant process could be hardened by maximizing utilization of features already present in the controls.
 - The successful adaptation of the proposed drive changes by the plant resulted in a significant decrease in PQ-related problems.



#5) Automotive Part Supplier Case Study – Flywheel Applications



1.1 Overview (1)

- Located in Tennessee, an automotive parts supplier has been experiencing interruption related shutdowns of their process equipment.
- The majority of equipment downtime issues have been caused by Interruptions of power and the effect on:
 - Two Kiln Lines in building 801
- The Utility hired EPRI to conduct a Power Quality Audit at the site to help formulate possible solutions.

1.1 Overview (2)

- EPRI and the Utility worked closely with the Automotive Parts Supplier to review the critical Kiln and Stick Coil Ovens power schemes.
- This work included:
 - Reviewing Installation Drawing
 - Physically walking down the power scheme to locate switchgear, Automatic Transfer Switches (ATS), Power Distribution Panels and Generators.
 - Discussed downtime issues with plant engineers and maintenance personnel.
 - Pre-sighting the location of possible flywheel based power conditioning that could be installed at the site.
 - Temporarily installing 4 PQ monitors at ATS locations in building 801 and 601.



Team Examines Switchgear and EDP panels in Bldg 801 Mechanical Room

1.1 Overview (3)

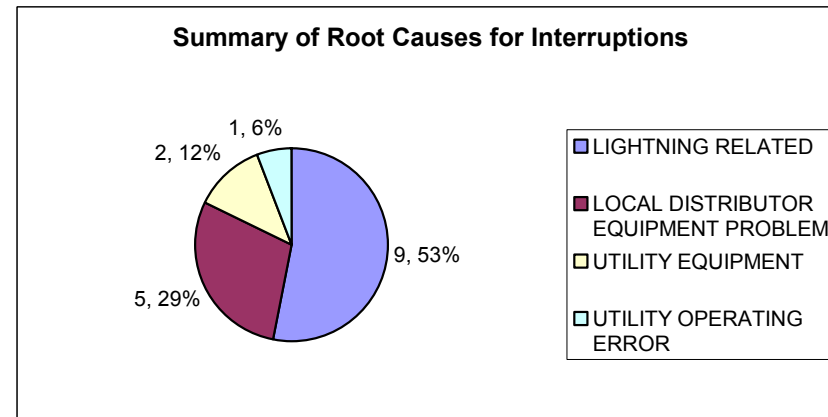
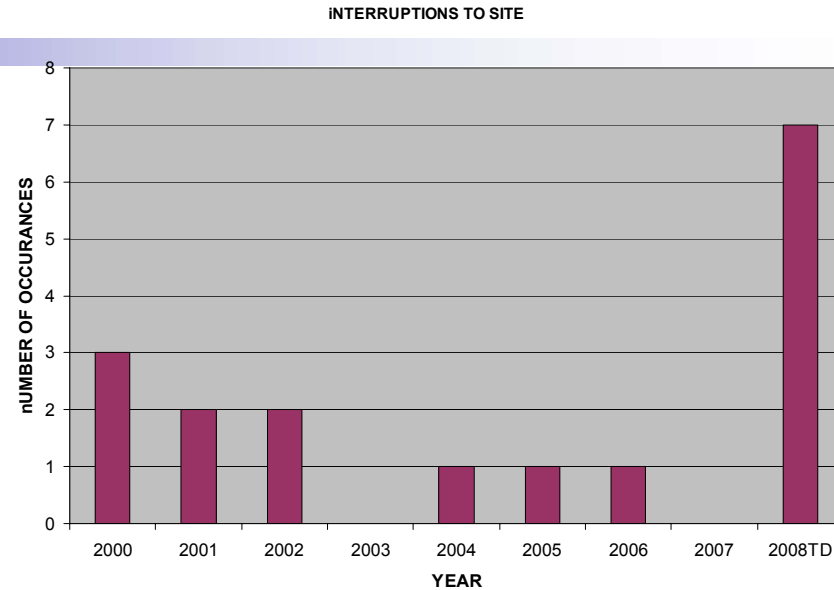
- The 801 Kiln Lines have diesel generator back-up for the processes.
 - The dead time between a power interruption event and the generator start-up still causes equipment shutdown and significant downtime.
 - Bridge Power solutions are needed to allow the process equipment to ride-through the events while the generator systems come on-line.
- This report contains the findings and recommendations from the PQ Audit.

Two 250kVA/200kW Diesel Gens for Kilns 1 and 2 in Bldg 801



1.2 Electrical Environment Summary

- Since 2000 there have been a total of 17 interruptions at the site.
- Of those 17, many were caused by issues at the local distributors sub.
- The majority of the interruptions were weather related (53%) followed by those caused by Non-Utility equipment (29%).

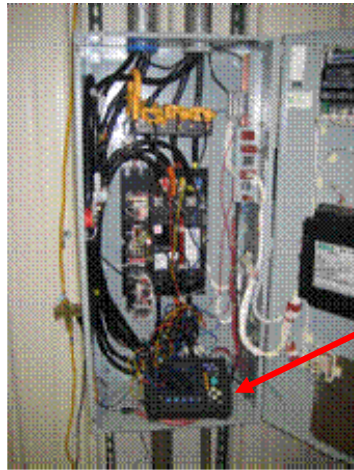


1.3 Approach

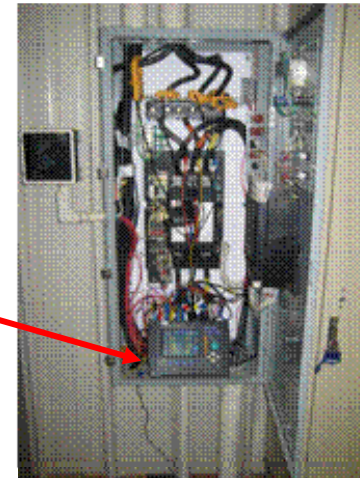
- In order to determine a solution to bridge the gap between a power interruption and the generator start-up, determination of the power profile is needed for the critical loads.
- EPRI and the Utility worked with the Automotive Supplier to install 4 power quality meters at the site in the Automatic Transfer Switch (ATS) Locations.
- Another critical consideration is footprint and ambient environment. These items were noted as well during the PQ Audit as described within this report.
- EPRI and The Utility evaluated two separate flywheel technologies for consideration by the Automotive Supplier.
 - CAT UPS
 - Pentadyne Flywheel with Liebert UPS

Temporary Power Monitoring Locations at in ATS Units (one week of monitoring at each location)

Kiln 2
ATS #2



Hioki
3196 Power
Quality
Analyzers



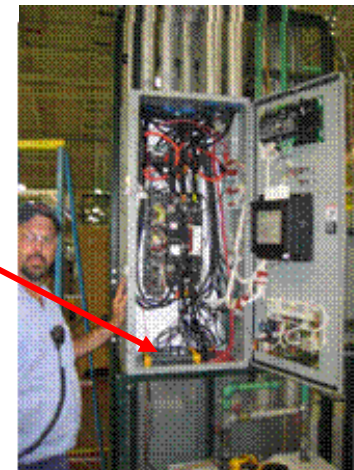
Kiln 1
ATS #1

BLDG 801 Mechanical
Room ATS Units



BLDG 601 Curing Oven 1 ATS

Fluke 435
Power Quality
Analyzers



BLDG 601 Curing Oven 2 ATS



Bldg 801 Kiln Analysis



Bldg 801 Generators

- EPRI Examined the two Diesel generators used for back-up power for Kilns 1 and 2.
- The two units are 250kVA/200kW CAT units.



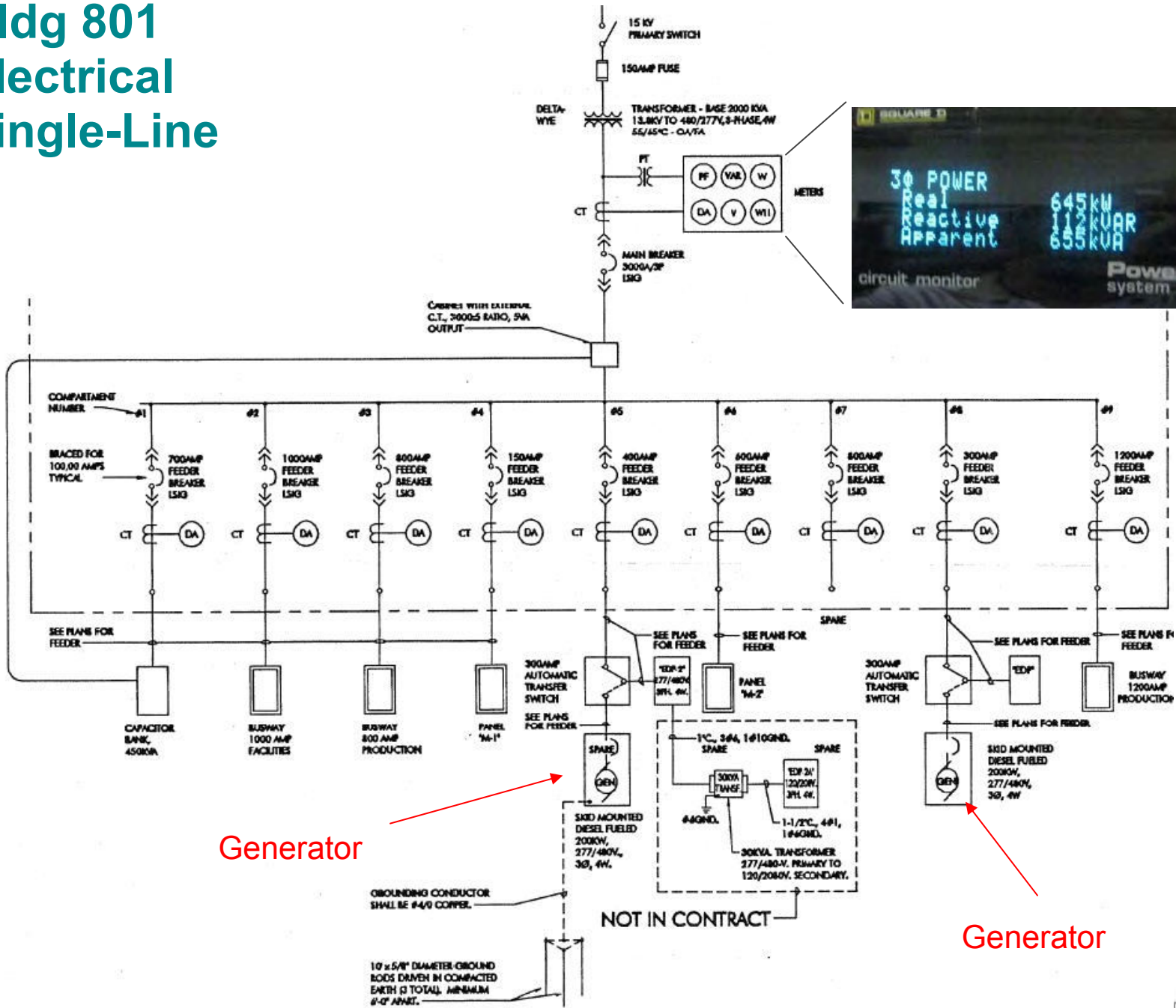
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OLYMPIAN™
OLYMPIAN is a trademark of CATERPILLAR Inc.

OLYMPIAN POWER SYSTEMS
114 MAWSONS WAY
NEWBERRY
SOUTH CAROLINA 29108

MODEL	D200P4_1	
SERIAL NUMBER	OLY00000ANNS00880	
YEAR OF MANUFACTURE	2003	
RATED POWER - STANDBY	250	kVA
	200	kW
	0.8	COS ϕ
RATED VOLTAGE	480 / 277	V
PHASE	3	
RATED FREQUENCY	60	Hz
RATED CURRENT	301	A
RATED R.P.M	1800	
MAXIMUM ALTITUDE	152.4	m
MAXIMUM AMBIENT		

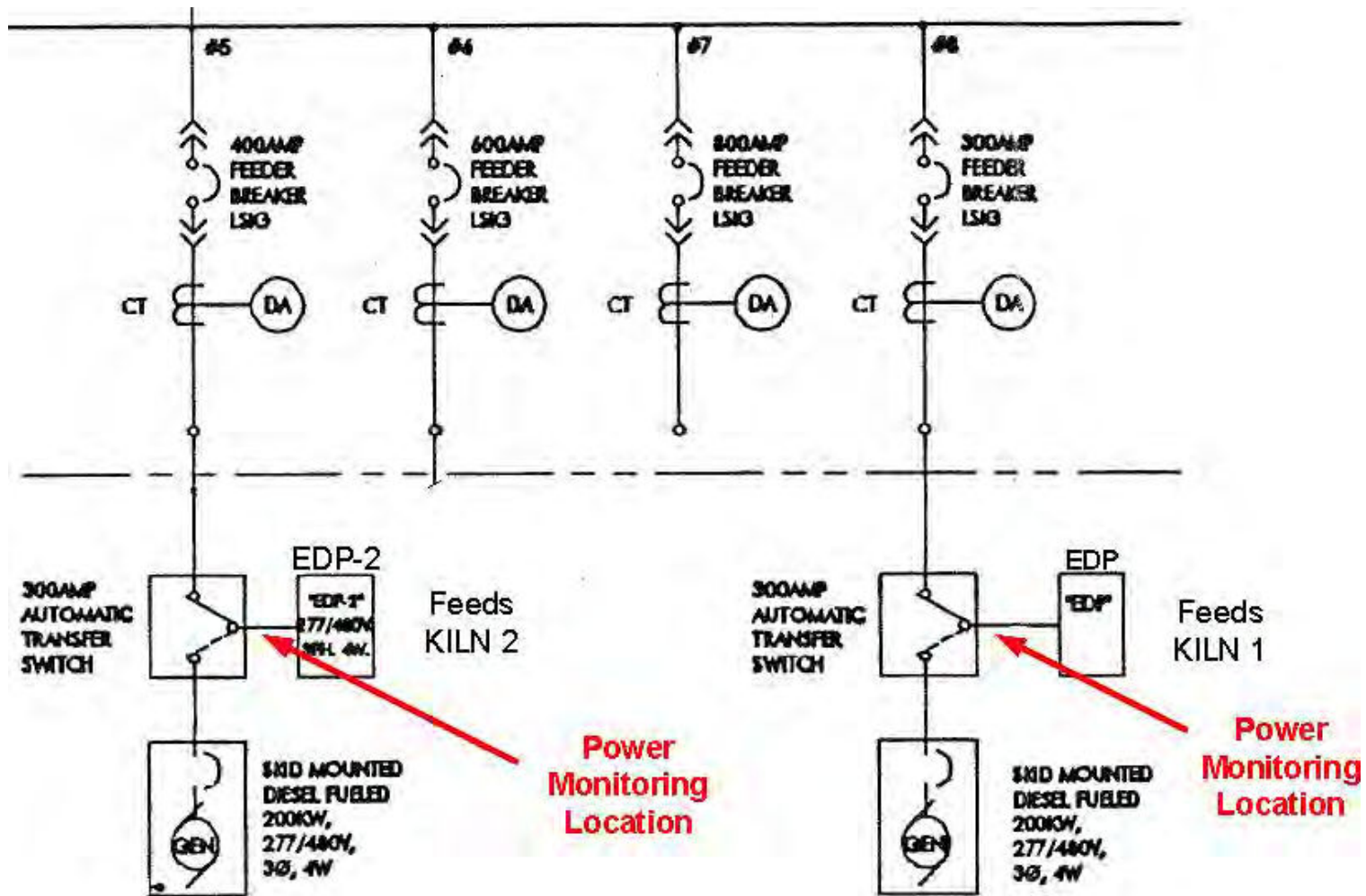
Bldg 801 Electrical Single-Line



Generator

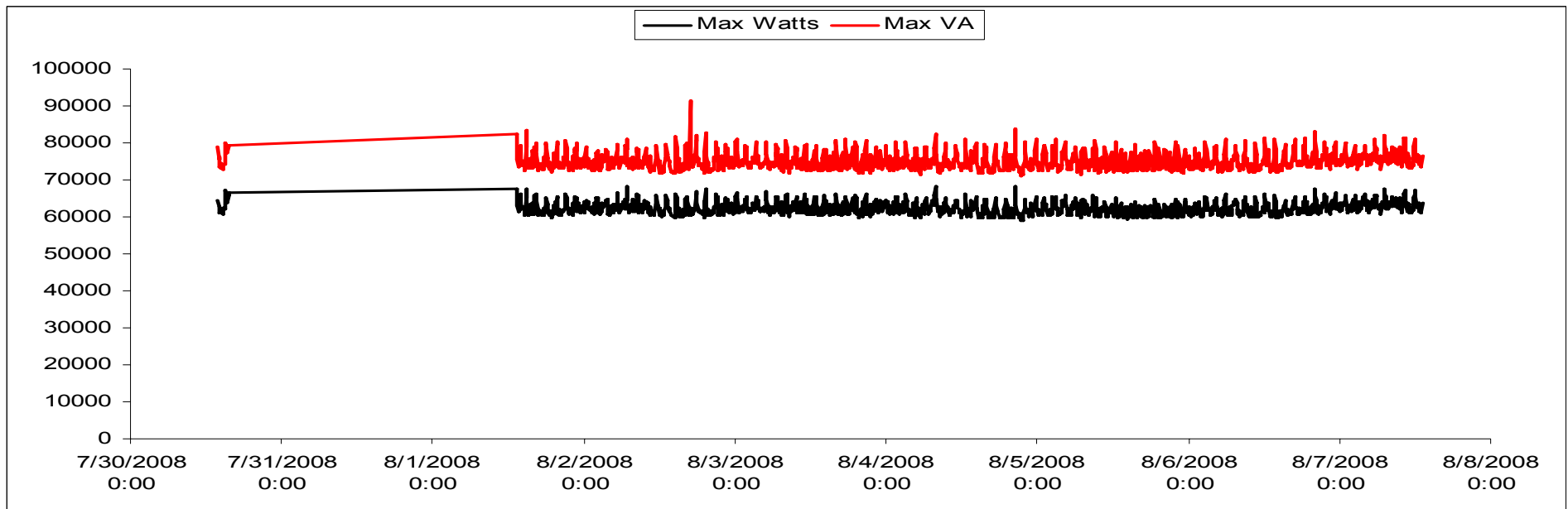
Generator

Load Measurements in Bldg 801



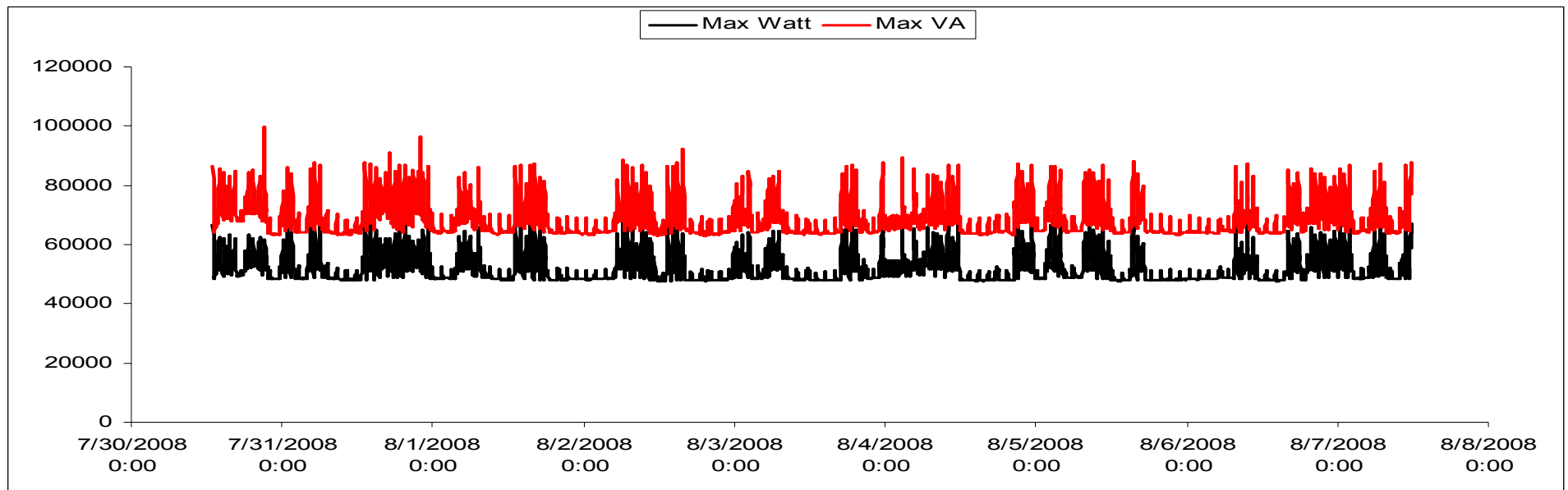
Kiln 1 Power profile

- Over 1 week of monitoring data showed the Average max power is 62.4kW and 75.1kVA
- The beginning part of this graph shows a power outage that caused the meter to reset.
- The maximum power seen was 92kVA



Kiln 2 Power profile

- Over 1 week of monitoring data showed the Average max power is 51.8kW and 68.2kVA
- The maximum power seen was 99.8kVA



Bldg 801 Kiln Data Monitoring Summary

- Over 1 week of monitoring data showed the Average max power of both kilns combined is 114.3kW/143.4kVA
- Kiln's did not appear to shut down for weekend shutdowns
- Power Factor for the ovens are as follows
 - Curing oven 1:
 - Min PF: 0.76
 - Average PF: 0.84
 - Max PF: 0.86
 - Curing oven 2:
 - Min PF: 0.55
 - Average PF: 0.75
 - Max PF: 0.81

Bldg 801 Mechanical Room Layout (2)



- The filter storage boxes can be relocated.
- There is more than enough room for a 10x10 concrete pad.

Bldg 801 Mechanical Room Temperature

- The Bldg 801 Mechanical room is not air conditioned.
- Prior to the installation of curtains around the Kilns, the temperature in the room reached extremes:
 - 103.8F 6/15/05
 - 106 F 6/27/05
 - 110 F 7/26/05
- Now, the temperature is expected to stay below 103 degrees on the worst case day per the Automotive Supplier.
- Installed solutions must be able to operate in the 103 degree environment.



CAT UPS:
104F Alarm Only
132F Shutdown



Pentadyne + UPS:
? Alarm Only
?F Shutdown



Bldg 801 Kiln Solutions

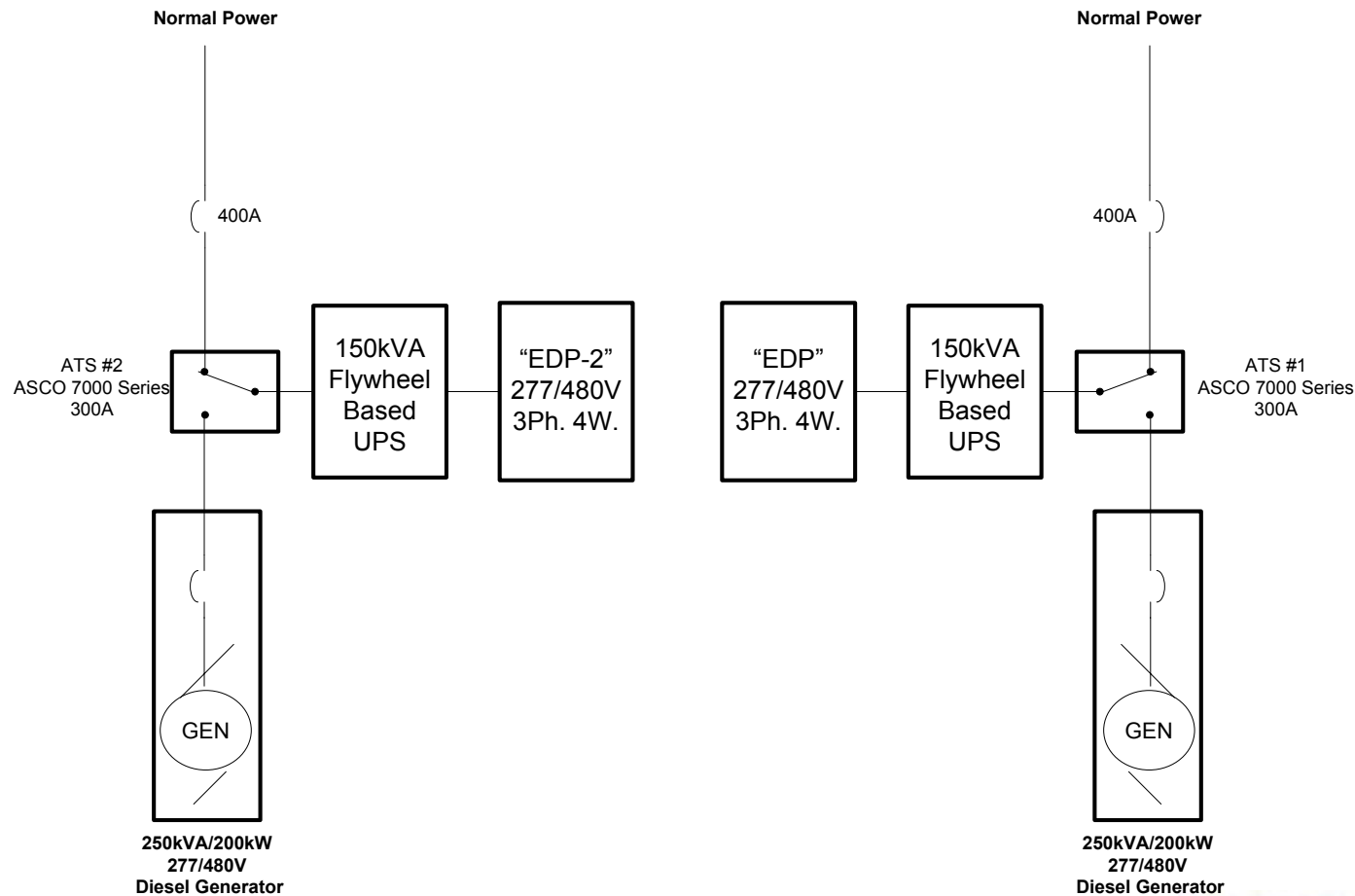


Solution Approach 1: (2) 150kVA Flywheel UPS Systems

- The loads for Kiln 1 and Kiln 2 are each below 99kVA maximum.
- Both the CAT UPS and Pentadyne systems have 150kVA sized units.
- This is the most economical approach.
- Both systems should be able to maintain output for at least 15 seconds at this loading level.

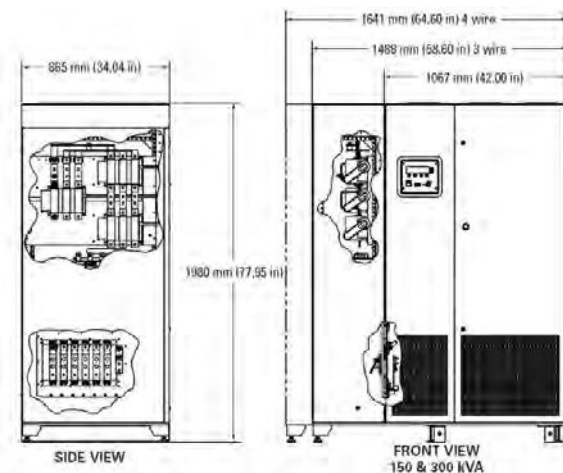
Solution Approach 1: (2) 150kVA Flywheel UPS Systems

- Note: Flywheel UPS units maintenance bypass not shown for simplicity.

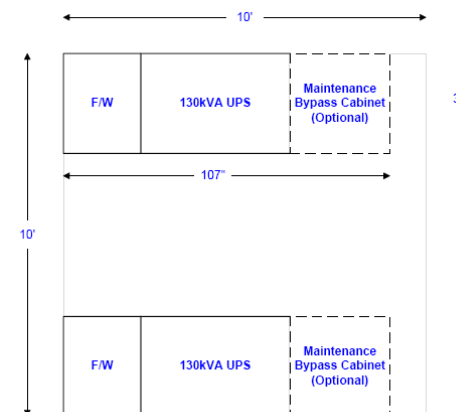


Approach 1 Details and Costs

- CAT UPS:
 - 150kVA Unit X 2
 - \$99,895 for each unit
 - \$199,790 total for two
 - Two Units Back to Back should fit in proposed area
 - Price includes maintenance bypass
 - See Attached Quote and Data Sheets from Stowers



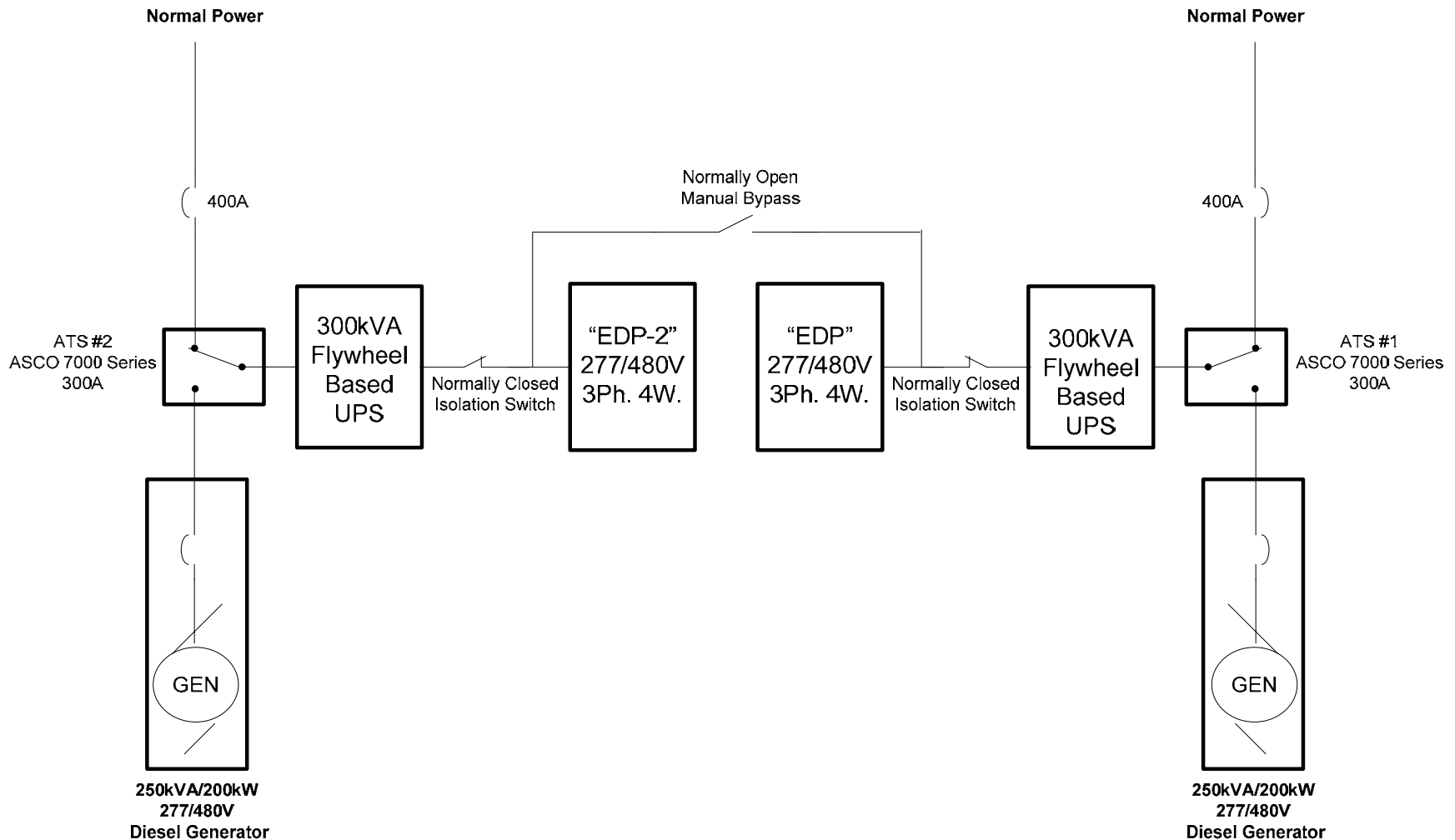
- Pentadyne/Liebert FS + UPS:
 - (130kVA UPS with 190kW Liebert FS flywheel) X 2
 - \$105,078.5 For each unit
 - \$210,157 Total for two
 - Two Units Back to Back should fit in proposed area
 - Price includes maintenance bypass
 - See Attached Quote and Data Sheets from Liebert



Solution Approach 2: (2) 300kVA Flywheel UPS Systems

- Upsizing the Flywheel UPS systems to 300kVA allows for redundancy.
 - Addition of manual bypass switch and two isolation switches on the output of the flywheels would allow for operation if there is a failure of a generator.
 - Flywheel UPS systems built with manual bypass so that they can be bypassed in the event of maintenance or failure of unit.
- While not the most economical approach, this method will allow for load growth and is could provide be beneficial in the long rung.
- Under normal circumstances (without bypassing), the 300KVA UPS systems should provide prolonged interruption covered in the 20+ second range if needed since they would be less than 50% loaded.

Solution Approach 2: (2) 300kVA Flywheel UPS Systems



Approach 2 Details and Costs

- CAT UPS:
 - 300KVA Unit X 2
 - \$116,770 for each unit
 - \$233,540 total for two
 - + Plus additional cost for new bypass and isolation switches
 - Price includes maintenance bypass
 - Two Units Back to Back should fit in proposed area
- Pentadyne/Liebert FS + UPS:
 - (300kVA UPS with 190kW Liebert FS flywheel) X 2
 - \$142,805 for each unit
 - \$285,610 total for two
 - + Plus additional cost for new bypass and isolation switches
 - Price includes maintenance bypass
 - Two Units Back to Back should fit in proposed area

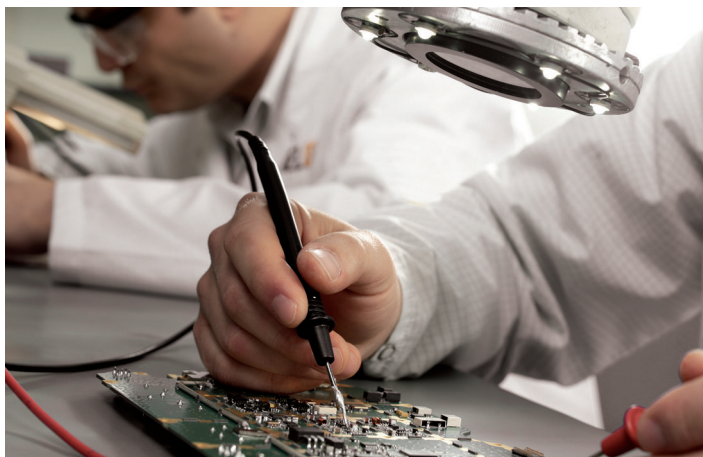
Case Study

Technical Repair Services

The Fujitsu Repair Centre

»The Fujitsu Repair Centre has created a benchmark for a diverse and comprehensive, repair and refurbishment Centre of Excellence. Our award winning reputation is based on a unique combination of technical expertise, quality results and exceptional customer service.«

Andy Stevenson, CEO, Fujitsu Telecommunications Europe Limited



The Customer

Fujitsu provide proprietary owned, as well as third party broadband technology equipment into major UK and European carriers, including: BT, KCom, Jersey Telecom and Gibraltar Telecom, amongst others.

The Challenge

Provide a comprehensive and commercially viable technical repair service to maximise the lifecycle of both Fujitsu proprietary products and third party broadband technology equipment, through an intelligent repair cycle.

The Solution

The Fujitsu Repair Centre is one of the largest product recovery and repair service providers in the UK. This highly successful, specialist division, handles the complete recovery, refurbishment and remanufacturing cycle, for carriers and Original Equipment Manufacturers (OEMs), from the purpose-built 25,000 sq. ft complex.

Undertaking the highest-quality electronic, electro-mechanical and cosmetic rebuilds of damaged, badly-worn or faulty items – Fujitsu recover as-new stock from products otherwise destined for disposal, and reduce waste by extending product lifetimes. Several thousand items are shipped every month, to customers throughout Europe and in the US.

Each customer has different repair timescales, so Fujitsu focus on fulfilling demand based on customer Service Level Agreements (SLAs). Extensive in-house test facilities are adapted to suit each project's requirements, with appropriate test programmes being devised accordingly. Acceptance tolerances are agreed with the customer in advance, to ensure that the as-new specifications are met and maintained as comprehensively as possible.

Fujitsu's product repair service is set-up into 5 areas that cover different product families including; fibre transmission equipment, copper and co-axial transmission equipment, switching equipment, motherboards and fan trays.

The Customer

- BT
- Gibraltar Telecom
- Colt
- Telent
- Jersey Telecom
- KCom

The Challenge

Provide an efficient and effective repair service for broadband access, telephone switching equipment and electro-mechanical products

The Solution

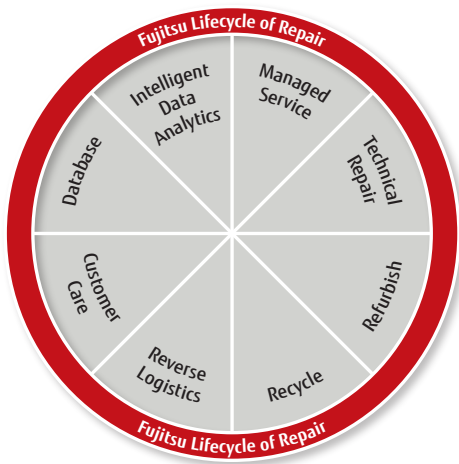
Offering an array of extensively proven, highly sophisticated, test and repair solutions; providing a cost effective, quality service to the customer

The Benefit

- Lengthening the lifecycle of the product
- Improved equipment reliability
- Product improvement feedback
- Maximum return on investment
- Industry accreditations including IIP, TL9000 and supplier excellence awards

Fujitsu's Lifecycle of Repair

Fujitsu's excellence in operating a Lifecycle of Repair for all products that come into the Fujitsu Repair Centre, is key to delivering consistent value to customers and high-quality, fully-managed repair solutions.



Working closely with the OEMs, Fujitsu ensure repairs are carried out in-line with their requirements. This includes the use of original manufactured components to maintain a high standard of first-time fix repairs.

Other added value solutions that Fujitsu's Technical Repair team undertake include:

- Cleaning of fibres
- Cleaning of line cards
- Anti-static working
- Database – product history (second-time returns)
- Specialist testing solutions

The Benefit

As part of the repair process, Fujitsu has worked with clients to introduce better working practises and product improvements. For example, Fujitsu's Technical Repair team liaised with Telent in regards to firmware codes for their inter-access 2 products, where the requirement was for Fujitsu to carry out a complete repair. In addition, Fujitsu carried out last-time buy of stock to enable repair beyond equipment obsolescence.

Fujitsu manage the receipt and dispatch of products with customers to ensure compliance with expectations. For instance, for BT the Fujitsu Stores team advises the recipient of release dates, and receive tracking numbers in return. This gives early visibility of delivery, enabling BT to book the goods in and ensures compliance with SLAs.

Fujitsu understand the integration between product families and has tailored repair and test solutions to suit. Another important factor is regularly communicating with product manufacturers to maintain a component base and be aware of obsolescence for last-time buys. A global purchasing power and worldwide relationships allow Fujitsu to source and purchase components where other providers may fail.

Fujitsu re-uses packaging, components, plastics and metals where possible, and re-use the materials within the printed circuit boards, under the EC directive regarding Waste Electrical and Electronic Equipment (WEEE). As well as being sustainable and environmentally friendly, it provides best value to customers and prolongs the life of the repaired assets.

Specifically designed, system reference and testing models are set-up to ensure that all repairs are fully checked in normal operation prior to dispatch. This includes checking circuitry and board level components utilising specialist electronic equipment. When common faults are diagnosed, Fujitsu implements a Change Order that applies a blanket repair on a particular fault type, thereby ensuring continual improvement to the customer and internal efficiencies.

On system reference models, calibration testing is carried out to ensure compliance with electrical regulations. Ongoing maintenance regimes are carried out on Fujitsu's system reference models and particular card spares.

Conclusion

The Fujitsu Repair Centre has a number of services that add value to the repair process including:

- Lengthening the lifecycle of all products under repair
- Intelligent component tracking – spotting obsolescence, last-time buys, alternative items, continuity of supply
- Liaising with customers – being proactive, by continually analysing Fujitsu's extensive database and identifying common faults or potentially defective components and notifying the customer

About Fujitsu

Fujitsu within the United Kingdom and Ireland provides ICT services to a large number of corporate, government and enterprise businesses, with annual revenues of over £1.5 billion. As a telecommunications specialist, Fujitsu Telecommunications Europe Limited provides expertise in the provision of integrated, end-to-end, next generation network solutions from initial design, development and manufacture through to, implementation, support, operation, maintenance and ongoing network management. In addition, the Fujitsu Repair Centre supports the refurbishment, renovation and repair of an array of telecommunications, retail and IT equipment.

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Reference: 3XAX-01245BNQ - Issue 02 - 2012/05

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