UNIT 1 PORTFOLIO MANAGEMENT AND *IT* APPLICATIONS

Structure **Page Nos.**

1.0 INTRODUCTION

A process can be used gainfully only when it is understood well, in this unit you will be made familiar with the objectives, steps, methods and gains of the portfolio management. This unit takes you through the first, and ultimately the most empowering, phase in portfolio management implementation. You will learn why establishing a portfolio management team with well-defined roles and responsibilities is critical. You will also gain an understanding of why it is crucial to carefully define the portfolio management process and choreograph its interrelationship with the budgeting process, the project proposal process, and other existing business processes.

You will learn how to apply these concepts in an operational organisation. This unit provides an understanding of the value of a portfolio management solution and offers insight into the types of functionality that must be inherent in such an application.

The world is getting increasingly interconnected and information is now centralised and we see businesses being pushed to the edge of the networks. In order to race to the market, security, and controls over such critical information tend to get overlooked.

This translates into issues related to confidentiality, integrity and availability of information — key controls in the information economy. Effective information risk management therefore assumes critical importance. Not only risk needs to be minimized but there is strong need for readiness for the disaster recovery. In this unit you will gain an insight for meeting these challenges.

1.1 OBJECTIVES

After going through this unit, you should be able to:

- define the portfolio management;
- explain the portfolio management methods and implement it;
- define the risk management and will be able to plan to alleviate it;
- explain disasters management;
- appreciate the challenges and issues of the portfolio management;
- select the tools of the portfolio management suiting the requirement, and
- Appreciate the emerging technologies.

1.2 WHAT IS PORTFOLIO MANAGEMENT

Portfolio Management is a process which facilitates determining the right (project) investments mix, i.e., deploying limited resources to maximize business performance, which is a key management challenge. Most capital investment activities take the form of projects that need to be managed as part of a portfolio. Project portfolio management entails balancing resources, business needs, business risks and changing parameters, while at the same time maximizing the return on (project) investment.

Portfolio Management was originally coined in the financial and investment community, and the term was used for the process of managing the assets of a mutual fund; including choosing and monitoring appropriate investments and allocating funds accordingly.

The adoption of the terminology into other industries such as real estate resulted in a modification of the term to reflect industry specific purposes. Similarly, within the technology sector, the term now applies to a set of projects or programs grouped collectively and monitored. We can define portfolio management as the expression of the alignment of the corporate and IT strategic plans, viewing the portfolio as a suite of complementary investments that collectively provide the best possible allocation of resources to meet the business needs of the corporation.

Portfolio Management (PM) applications integrate all project-related informations within a single, web-based enterprise solution. Organisations use PM solutions to better align and manage their projects, people, and partners so that they can achieve greater return on their portfolio of investments.

Basically, Portfolio Management is a discipline used to ensure that a correct mix of investment activity is initiated, grouped, funded and managed. Technology assets are categorised as an investment portfolio allowing for:

- Investment bundling
- Prioritisation
- Evaluation
- Decision insight and support
- Balance between timing, current needs, and future requirements

Considering the complexities, the problem of managing the technology portfolio is broken into set of smaller problems to facilitate analysis. Among the issues to be considered when discussing the technology portfolio are:

- Technology / business alignment
- Investment balance
- Resource management
- Negotiation between competing projects or goals
- Risk mitigation and management
- Technology performance and reporting

Considered as part of the whole, each contributes to the overall portfolio. Considered independently, each is both a manageable problem and a powerful tool.

Portfolio Management Objectives allow the organisation to be focused, fast, and agile. Achieving these high level objectives necessitates a variety of inter-related steps. These include the following:

- **Grouping:** Synergies between technology spending plans with business strategy;

- **Investment Focus:** Viewing expenditures (human, asset, capital) as investments. This also includes a process to track performance;
- **Governance:** Process for making IT investment decisions;
- **Cost Control:** Understanding the main drivers of IT costs for restraint purposes, and
- **Efficiency:** Use of financial resources efficiently, leveraging wherever possible.

Various methods are used to create and balance the portfolio, ranging from highly strategic to tactical:

Financial portfolio analysis: Balance and risk mitigation is achieved by spreading investments over a number of different initiatives. Projects are balanced across a number of categories that can include strategic or business objectives, compliance or required maintenance and research and development. Depending on the organisation's objectives, this allows steering committees to incur the least risk and take advantage of market dynamics.

Top down / bottom up: Companies either apply the big picture of top-down thinking that looks at growth, or how dual projects or business unit objectives provide benefits in bottom-up planning. Both exercises are popular with immature project organisations. However, if conducted separately in a vacuum, it provides a restricted view of the inter-relationships of projects to the organisation. A combined top down/bottom-up approach is the desired solution for such an endeavor.

A variety of **Portfolio Management Benefits** are possible for the organisation successfully executing a PM initiative. Chief among these is the expression of value in business terms.

Other key benefits include:

- Insight into schedule / budget variance
- Return on investment calculations
- Increased resource utilisation and reduced headcount
- Extrapolating financial benefits of a project
- Project interventions and results
- Discontinued projects or corrective measures as necessary

Ultimately, a portfolio management for technology organisations will offer IT management and a sense of symmetry with business objectives; like, a project selection approach based on hard data and the metrics, costs, budgets, and other objective criterias.

It should be noted, however, that as long as IT continues to plan at the individual initiative level, the tactical and reactive nature of most IT organisations would remain. Effective portfolio planning and management bridges the gap towards flexibility and risk mitigation.

There are five primary **value addition** propositions that can be achieved with the implementation of a PM solution. These include:

- **Align Business Strategy and Execution:** Integrate executive guidance (portfolio and financial plans), line sponsorship and project-level execution so that you do the right work;

- **Plan and Execute effectively and efficiently:** Standardise workflows and automate business processes so that you can do the right work faster;

- **Leverage Resources (People, Partners, Money and Assets):** Manage resources across the enterprise and around the world so that you use the right resources;

- **Make global teams more productive:** Share and reuse information, work products and templates so that you do the work right, and

- **Improve visibility and control:** Gain organisational transparency so that you can identify and solve problems early.

The market for Portfolio Management solutions is full of competitive offerings. It is important that PM software evaluations base evaluation criteria on value versus just features and functions. Traditional feature / function evaluation approaches can mislead an organisation to select an application that does not deliver a return on investment, or worse yet, provide a stopgap solution to only part of the problem.

Portfolio Management Requirements that must be available in the offered / selected PM solution can be judged based on recognising the importance of achieving value and measurable return on investment and variety of features and functions which must be present in the PM solution.

These can be broadly categorized into four functional areas:

- Budget and Financial Management;
- Business Planning and Portfolio Management;
- Project and Resource Management;
- Collaboration and Knowledge Management.

The **budget and financial management** functionality of a PM solution should integrate with existing financial and Enterprise Resource Planning (ERP) applications to provide the organisation with real-time project-based budget and financial management capabilities. Easy access to accurate project-based financial information is mandatory so that the organisation can make better and faster business decisions and invest money for maximum return. Functionality should also be provided to automate traditionally manual processes so that resources previously wasted on redundant data entry, manual analysis of project cost estimates, actual time and expenses can be redeployed.

Benefits that should be enabled by the application include the ability to:

- Align spend with projects of greatest return;
- Utilise project-based budgets to make better decisions;
- Manage project budgets against financial objectives, and
- Make project budgets transparent to sponsor organisations.

Functionality required while delivering the above value and benefits include:

- Project and Resource-driven Budget and Approval Process;
- Budget by project, initiative and organisation;
- Budget billable and non-billable projects;
- Budget revenue and expense;
- Configure budget rules;

- Define multi-year and rolling budgets;
    - **Comprehensive Rate Management:**
        - Define flexible rates for budget;
        - Establish multiple rate hierarchies;
        - Use the same or different rates for actual;
    - **Integration:**
        - Integrate with third-party general ledger systems, including providing and sponsoring cost center transactions;
        - Perform prior period adjustments;
        - Align budget management with project management;
    - **Chargeback:**
        - Budget project chargeback to sponsoring organisations;
        - Incurred vs. budgeted cost chargeback;
    - **OLAP Reports:**
        - General ledger cost analysis;
        - Actual vs. total budget;
        - Project detail cost analysis;
    - **Additional Financial Management Functionality:**
        - Inclusion of capital expenditures in non-labour expenses;
        - Incremental project funding;
        - Major expenditure requests;
        - Real-time data vs. historical data views;
        - View-based (resource, cost center, or organisation) breakdown of labour components salary, fringe, etc.

As an example, budgeting is a relatively mature process within the majority of organisations. However, the corporate requirement to ensure alignment with changing business and economic condition necessitates a continuous re-budgeting in order to remain competitive. As a result, thousands of hours of time, effort and paper are required to keep budget data current and aligned.

In the 'bottom-up' and 'top-down' budgeting method, an easy way to understand look and feel can be provided. Top-down budget amounts are provided by the sponsoring organisation, and subsequently, the budget layers are built up project-by-project, program-by-program. It is vital to note that budgeting is conducted at the work level, not the cost-center level, thereby ensuring accuracy. The system also feeds the corporate budgeting system, thus allowing management of both the provider side and the consumer side.

Another critical feature facing the financial severity is funding. This notion provides the benefit of releasing the total money associated with a project. Thus, a project with a large budget may only receive a portion of the allocated funding in the initial stages, with the balance released upon completion of defined milestones. This allows project sponsors to effectively govern the distribution of funds and re-allocate funds midstream if necessary. Funds can be allocated in stages and even from other projects.

The **business planning and portfolio management** aspects of a PM application should enable the organisation to define, evaluate, and monitor their portfolio of projects for maximum return on investment. Organisations should be able to use this functionality to establish the definition, scope, risks and expected return for their portfolio of projects. In addition, they should be able to model new and existing projects to determine the optimum portfolio mix that maximizes their investment return.

Once portfolios are defined and prioritised against corporate objectives, organisations should be able to monitor project portfolios through customisable views. With real-time access into performed project work and planned project resources, organisations should be able to use the PM application to ensure their portfolio of projects, remains aligned with corporate objectives, identify and resolve project risks and resource bottlenecks, and proactively make decisions to maximise return on investment and minimize time to market.

Benefits that should be enabled by the application include the ability to:

- Select the most important projects;
- Establish the right definitions of project success;
- Monitor project performance against objectives;
- Re-align projects when market conditions change, and
- Cancel low priority and failing projects quickly.

Functionality required delivering the above value and benefits include:

- **"What if" scenario modeling / Sensitivity Analysis:**
  - Compare portfolio plans against current operating plans
  - Analyse the impact of new projects on the portfolio
  - Drag and drop schedules
  - Create multiple versions of project portfolio to compare against supply
- **User-defined views:**
  - By project (past, in progress, or planned)
  - By resources (staff, skills or budget)
  - By schedule (past, current, or projected)
- **Multiple criteria based views:**
  - Actual vs. planned
  - Actual vs. budget
  - Actual vs. schedule
- **OLAP Reporting:**
  - Project work by project type
  - Planned vs. actual work
  - Project work by project priority
  - Track initiative status
  - View initiative projects at a glance
  - View initiatives in Gantt charts
- **Simulating projects:**

The **project and resource management** component of a PM application should provide a single record of all project-related activity so that project stakeholders at all levels are equipped with relevant and actionable information to make better and faster decisions throughout the project management lifecycle. It should enable an organisation to build project plan with speed and precision while utilizing fewer and lower cost resources.

Benefits that should be enabled by the application include the ability to:

- Manage project plans to objectives;
- Communicate and monitor work for better results;
- Identify and resolve problems early;

- Manage dependences across projects;
- Assign the right people to the right projects;
- Fully utilize FTEs and reduce contractor costs;
- Leverage resource talent across your global enterprise, and
- Take advantage of resources in lower cost geographies.

Functionality required delivering the above value and benefits include:

- **Initiative Management:**
  - Set up unlimited hierarchical relationships initiatives, programs and projects
  - Monitor initiative home pages and configurable dashboards
  - Define initiative charters and goals
  - Track initiative risks and issues
  - Run initiative reports
  - Track initiative status
  - View initiative projects at a glance
  - View initiatives in Gantt charts
- **Project Management:**
  - Establish customizable project home pages
  - Define project charters and goals
  - Define project team members and stakeholders
  - Plan, assign and monitor tasks, deliverables, and milestones
  - Plan and monitor dependencies within and across projects
  - Define project impacts and drivers
- **Risk and Issue Management:**
  - Define and monitor risks and issues
  - Assign issue and risk actions
  - Status issues and risks
  - Identify common risk and issues across projects
- **Resource Management:**
  - Define hierarchical skills profiles for resources
  - Request and allocate resources
  - Allocate resources based on weighted proficiencies
- **Time and Expense:**
  - Record time and expenses for project tasks
  - Route time and expense approvals
  - Lock approved timesheet data
  - Capture and report non-billable time and expenses
  - Establish user-defined billable hour maximums
  - Report on missing timesheets
  - Configure alerts for timesheets that are overdue or await
  - Define timesheet periods
  - Billable vs. non-billable time tracking
- **Microsoft Project and Project Server Integration:**
  - Synchronized project, task and resource management
  - Integrated OLAP reporting
  - Shared configuration and security administration
  - Configurable field mappinging.

Collaboration and Knowledge Management capabilities that span the processes of portfolio, budget, project, resource, and external relationship management must be available in the Portfolio Management Software selected. A Web-based user interface is necessary to enable organisations to seamlessly collaborate and share project-related information across internal and external project teams.

Benefits that should be enabled by the application include the ability to:

- Establish a single source for all project-related information,
- Empower project teams with relevant and actionable information,
- Collaborate seamlessly across geographies and business partners.

Functionality required to deliver the above value and benefits include:

- **Customized Home Pages:**
    - Organisational, initiative, project, and individual views
- **Knowledge Sharing across the Extended Enterprise:**
    - Document management including check-in/check-out and version history
    - Templates of standard documents, plans, and budgets
    - Forums for threaded discussions
    - User-configurable views
    - Email documents
- **Role-based User Support:**
    - IT, R&D, financial and line of business executives
    - Project managers
    - Global project team members
    - Customers
    - Partners
    - Contractors and service providers
- **Comprehensive Reporting:**
    - OLAP reports
    - Standard reports
    - Crystal reports
    - Adhoc reports
    - PowerPoint charts
- **Security Administration:**
    - Password composition and frequency restrictions
    - Exportable login audit log

The Role of Services is critical in the successful implementation of a PM solution. Issues including integration with ERP applications, backend databases, as well as the skill and expertise required to deliver the above, are crucial aspects of a PM vendor's strength.

Each step in the implementation process must be designed to deliver incremental benefits, even those before the sales commitment. This allows for the enterprise to achieve more value sooner, however a traditional "big bang" that takes longer to implement, reduces total value, and has a higher risk.

The software must provide tools to enable services team to develop and provide detailed work plans, monitoring progress via weekly status reports, maintaining logs of issues and risks, and ensuring oversight of bug and enhancement requests. As part of the transition management strategy, the team should conduct extensive executive workshops and interviews, executes upon a comprehensive communications plan, and delivers upon a value assessment.

Another key ingredient in any successful software implementation is end user acceptance and usage. In a nutshell, **Transition Management** is the process of deliberately influencing the human, organisational and workflow aspects associated with a change or introduction of technology to achieve the desired results. This notion must be integrated into the overall implementation process. By ensuring that the enterprise quickly and effectively adopts its new technology, productivity as an organisation and more competitiveness in their industry is within reach.

Enterprises should look to realize the following benefits from a transition management effort:

- Broadened ownership of implementation success across organisations by creating goal alignment through early, end-user involvement;

- Minimized organisational barriers to success by identifying and mitigating organisational issues that will either lengthen the implementation or jeoparadize its success;

- Improved organisational knowledge and skills for the new environment, as well as increased organisational effectiveness during implementation;

- Accelerated attainment of projected benefits by focusing on post-implementation issues like user acceptance, productivity, and human performance support, and

- Pass on ownership feeling to the end-user at the early stage of the project.

1.3 DESIGN AND IMPLEMENTATION OF PORTFOLIO MANAGEMENT

Before we get into the Design and Implementation of Portfolio Management, let us look once again at the benefits expected from the implementation of the Portfolio Management. These are:

- Maximize value of IT investments while minimizing the risk;
- Improve communication and alignment between Information System group and business leaders;
- Encourage business leaders to think “team,” not “me,” and to take responsibility for projects;
- Allow planners to schedule resources more efficiently;
- Reduce the number of redundant projects.

There’s no single right way to do IT portfolio management. Vendors, consulting companies and academics offer many models, and often companies develop their own methodologies. Off-the-shelf software is available from a variety of vendors but there are plenty of hurdles to doing it well. There are, however, best practices and key logical steps that can be learned from the organisations which have integrated portfolio management into the fabric of IT management.

Here are the key steps in creating and managing the IT investment portfolio based on the experience of gained from several companies.

Step 1 Assemble: Project Inventory

Portfolio management begins with gathering a detailed inventory of all the projects in the company, ideally in a single database, including name, length, estimated cost, business objective, ROI and business benefits. There are MNC's who maintain a global database of all its IT projects using software from established IT vendors.

In addition to project plan information, all company users—which may be in thousands from various regions and countries—will have to add weekly updates on how much time they spend working on projects. This is used to gather information on resources.

Creating a project portfolio inventory can be painstaking but is well worth the effort. For many companies, it may be their first holistic view of the entire IT portfolio and any redundancies. A good inventory is the foundation for developing the projects that best meet strategic objectives.

Step 2 Evaluate: Identify Projects that Match Strategic Objectives

A logical starting point creates a product strategy — markets, customers, products, strategy approach, competitive emphasis, etc

The next step involves establishing a portfolio process. The heads of business units, in conjunction with the senior IT leaders in each of those units, compile a list of projects during the annual planning cycle and support them with good business cases that show estimated costs, ROI, business benefit and risk assessment. The leadership team vets those projects and shifts out the ones with questionable business value.

Next, a senior-level IT steering committee made up of business unit heads, IT leaders and perhaps other senior executives meets to review the project proposals; a good governance structure is central to make this work. Portfolio management without governance is an empty concept conversely; putting portfolio management in place can force companies with weak governance structures to improve them.

One of the core criterion for which projects get funded is how closely a project meets a company's strategic objectives for the upcoming year. For this purpose an executive leadership team, which may include the CEO, may create strategic initiatives, such as CRM or organisational excellence. The IT governance council, made up of business leaders and senior IT leaders, then may evaluate projects based on how well they map against those initiatives. It is worthwhile to assess risk from a technology point of view, a change-management point of view, the number of people that a project will impact and whether it will involve huge reengineering. Using methodology borrowed from the product development group (modified for IS, but keeping terminology that business executives are familiar with), projects are may be placed "above the line"— those that should be funded, or "below the line"— those that shouldn't.

A project portfolio review board (comprising of senior officers / departmental heads) may further evaluate the project opportunity assessment for every proposal.

A good evaluation process can help companies detect overlapping project proposals up front, cut off projects with poor business cases earlier, and strengthen alignment between IS and business executives.

Step 3 Prioritize: Score and Categorise Projects

After evaluating projects, most companies will still have more than they can actually fund. The beauty of portfolio management is that ultimately, the prioritisation process will allow you to fund the projects that most closely align with your company's strategic objectives.

Next, the projects are required to be placed into portfolios—multiple portfolios may be a good idea in many companies because they allow alike projects to be pooled together.

In case of the large technology portfolio, its management team—made up of project sponsors, function managers (for example, representatives from engineering, financial services and operations, and CEO himself) and product portfolio managers (people with long-term project leadership responsibilities in areas such as services or data management)—may vet projects and come up with a list for the portfolio team to score.

They then prioritised them using a model that has four key tenets:

a) **Identify four to seven strategies:** For example, limiting technology risk and increasing the reliability of the infrastructure.

b) **Decide on one criterion per strategy:** For example, the team decided the criterion for limiting technology risk would be whether the technology had been implemented in a comparable organisation and the benefits could be translated to the company easily.

c) **Weigh the criteria:** Allocate the weight to each criteria.

d) **Keep the scoring scale simple:** Many companies use a scale of one to five. For the technology risk strategy, five might mean that it has been used in a comparable organisation and the benefits could be transferred easily; three could mean it's hard to do because it would require changing processes; one might mean they haven't seen it work anywhere else.

Following the scoring, the team may draw a line based on how many projects it could do with existing resources. In the case of the large technology portfolio, the line may be calculated where demand (the list of projects) meet supply (resources—in this case, the cumulative money value of available application engineers plus overhead); the line may be a little less than halfway down the list. Those projects above the line could be taken up immediately.

There is no one method to categorise IT investment portfolio. One approach is to categorise it as you would do with your own financial portfolio, balancing riskier, higher reward strategic investments with safer categories, such as infrastructure. Some companies recommend a portfolio divided into three investment categories: running (keeping the lights on), growing (supporting organic growth) and transforming the business (finding new ways of doing business using technology). Those categories can then be cross-tabulated with four to five value-focused categories, such as how those investments support revenue growth, reduce costs or grow market share.

In another model, based on their the previous experience, companies view their IT portfolios on multiple levels and at different stages, by visualising their investments in aggregate and placing them in four categories, with the per cent of IT expenditures apportioned across each. For example they may have 5 per cent [of the projects] in strategic areas, 15 per cent to 20 per cent in the informational category, and the remaining percentage split between the infrastructure and transaction modules,

The payoffs that come from a thorough evaluation and prioritisation process is the primary reason portfolio management is so effective. Firstly communication between IS and business leaders improves, and portfolio management gives business leaders a valuable, newfound skill—the ability to understand how IT initiatives impact their companies.

Secondly, business leaders think "team," not "me," and take responsibility for projects. One tried-and-true method for how a business leader got money for his unit's projects was to scream louder than everyone else. Portfolio management throws that practice out the corner office window; decisions are made based on the best interests of the company.

Thirdly, portfolio management gives business leaders responsibility for IT projects. No longer the IT persons had to sell these IT projects to the business. For example a project for marketing, it's the marketing executive who has to sell the project to the rest of the team. In the changed scenario, (instead of the technology people who were earlier proposing the projects) now the businesspeople propose the projects and [take responsibility] for risk profiling, ongoing operational costs and timeliness of delivery.

Finally, everybody knows where the money is flowing and why, which is especially important to CEOs and CFOs who are increasingly demanding that technology investments deliver value and support strategic objectives.

Step 4 Review: Actively Manage the Portfolio

A top-notch evaluation and prioritisation process is ineffectual rather quickly if the portfolio is not actively managed following approval of the project list. Doing that involves monitoring projects at frequent intervals, at least quarterly (preferably it should be monthly), the project management office is required to get financial and work progress perspective updated from project leaders. This information is required to go into a database, from where the project inventory and its status is circulated to all concerned. Some of the companies assign project status—green (good), yellow (caution) or red (help!)—and include an explanation of the key driver causing a yellow or red condition. The IT steering committee meets once a month to make decisions to continue or stop initiatives, assess funding levels and resolve resource issues.

Monitoring project portfolios regularly also means projects that have run off the rails can be killed more easily. "People have an aversion to stopping projects, but the majority of projects which are canceled are done because there's a change in company strategy—a change in priority or direction. For example, if there's a strategy decision to focus on SAP, then it makes sense to cancel a new system that interfaces with PeopleSoft.

Portfolio management is a good thing. But getting to nirvana requires a serious commitment from both the business and IS sides, as well as a whole lot of sweat equity. Here are some of the pitfalls and ways to overcome them.

- **Democracy is not easy:** Taking power away from business leaders accustomed to calling the shots will not always go smoothly.
- **Group decision:** Business leaders who didn't have decisions scrutinized previously now are [having] decisions decided by group consensus, people realize it does work and that group of people can make better decisions than one or two making unilateral decisions.
- **There's no single software that does everything:** "There are really good budget packages, resource management packages and fairly good portfolio management packages, but no package that ties it all together,"
- **Getting good information isn't easy:** Take, for example, the transparency of the cost structure. There has to be good information around all technology costs and investments
- In addition, **database must be updated regularly**, so that there continuous flow of status of each project to the concerned persons to enable them to react quickly to market changes.
- **It's still hard to make tough decisions on whether to undertake—or cancel—projects:** as an organisation has a tendency to say, we shall figure out a way to make those work."
- **It's an additional time constraint on busy executives:** Good portfolio management means good IT governance means regular IT governance committee meetings. Just about every company today has its people stretched.

1.4 PORTFOLIO MANAGEMENT METHODS

We have gone through the implementation of portfolio management at Para 5.3 above. The basic steps for implementation are:

1) Collect / identify all ongoing and proposed projects / opportunities.
2) Out of the list compiled at a) above, identify/evaluate projects/opportunities which meet strategic requirement of the company.
3) Prioritize as per the score & categorize these projects/opportunities.
4) Review the projects/opportunities for adoption plan and monitor their implementation.

Each of the above steps can be carried out by different methods. In fact Portfolio Management vendors, not only present their own variant of methods in their packages, but these packages have some minor variations in sequence of these steps also. We will be discussing some of the common methods for each of these steps.

Step 1: Collect information on all projects (on-going and planned): In this step goal is to collect all relevant information on the projects like, status of the project, resources used and required for completion of the project, project schedule and the risk factor involved. Methods used for this are:

- **Central repository** based present day systems which collect data in formats generated (based on initial key information / data entered) by the system and stored in the data base.

- **Conventional procedures** of project management, wherein data is entered for each project and stored in a common database.

Step 2: Evaluate for Strategic Compliance: A logical starting point for this step is to create a product strategy — markets, customers, products, strategy approach, competitive emphasis etc. Some companies define these strategies in terms of Key Performance Indicators (KPIs). Once strategy is defined then each identified project / opportunity is evaluated against strategy to determine if those opportunities are in line with the corporate strategic direction. In a sense, this may be the identification and initial screening of projects before more in-depth analysis is conducted. The questions asked are: What is the project? Does the project fit within the focus of the organisation and the business strategy and goals? This evaluation is done in two manners: (a) Tactical Evaluation, and (b) Financial Evaluation.

a) Tactical Evaluation

- **Top-down, strategic buckets:** Begin at the top with your business's strategy and from that, the *product innovation strategy* for your business – its goals, and where and how to focus your new project efforts. Next, make splits in resources: 'given your strategy, where should you spend your money?'. These splits can be by project types, product lines, markets or industry sectors, and so on. Thus, you establish *strategic buckets* or envelopes of resources. Then, within each bucket or envelope, list all the projects – active, on-hold and new – and rank these until you run out of resources in that bucket. The result is multiple portfolios, one portfolio per bucket. Another result is that your spending at year-end will truly reflect the strategic priorities of your business.

- **Top-down, product roadmap:** Once again, begin at the top, namely with your business and product innovation strategy But here the question is: 'given that you have selected several areas of strategic focus – markets, technologies or product types – what major initiatives must you undertake in order to be successful here?'. It's analogous to the military general asking: given that I wish to succeed in this strategic arena, what major initiatives and assaults must I undertake in order to win here? The end result is a mapping of these major initiatives along a timeline – the project roadmap. The selected projects are 100% strategically driven.

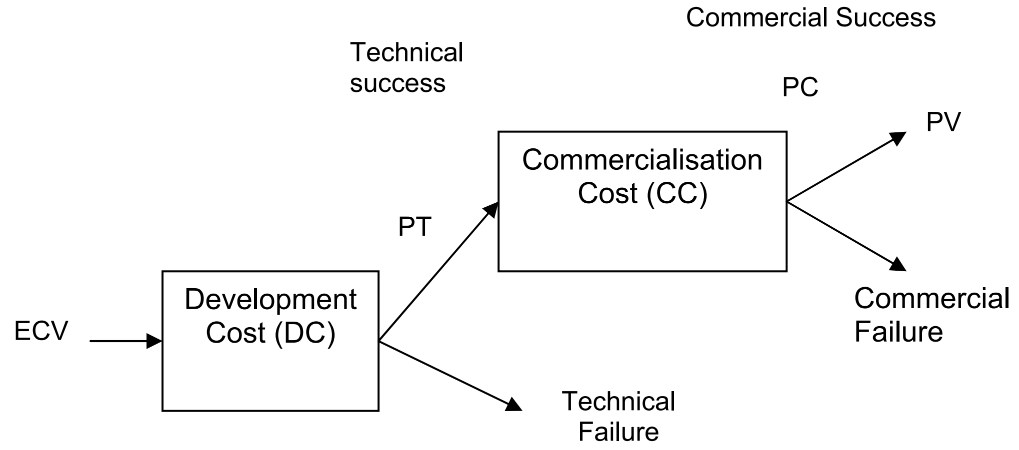
- **Bottom-up:** "Make good decisions on individual projects, and the portfolio will take care of itself" is a commonly accepted philosophy. That is, make sure that your project gating system is working well – that gates are accepting good projects, and killing the poor ones – and the resulting portfolio will be a solid one. Even better, to ensure strategic alignment, use a scoring model at your project reviews and gates, and include a number of strategic questions in this model. Strategic alignment is all but assured: your portfolio will indeed consist of all "on strategy" projects (although spending splits may not coincide with strategic priorities).

b) Financial Evaluation

It is to further define the project (if needed) and to analyze the details surrounding its utility. The utility of a project captures the usefulness of the project, its value, and is typically defined by costs, benefits, and associated risks. The questions to ask are: Why should this project be pursued? What is the usefulness and value of the project? Several things are to be considered. Establish criteria and develop a model to support decision making; Make sure accurate data is available to make decisions. Establish a process to analyze the project information; uniformly apply the methodology across the organisation. The different methods for valuation are:

- **Net Present Value (NPV):** In this method for each project NPV is determined which is divided by the key or constraining resource. For example for the Project A NPV will be divided by X where X is costs still left to be spent on the project A.; that is, Portfolio Index of this project will be NPV/X. Some of the companies multiply this factor by probability (say P) of completion of the project. Then Portfolio Index will be NPV * P / X. Projects are rank-ordered according to this index until out of resources, thus maximizing the value of the portfolio (the sum of the NPVs across all projects) for a given or limited resource expenditure.

- **ECV:** The Expected Commercial Value method uses decision-tree analysis, breaking the project into decision stages – e.g., Development and Commercialisation (*Figure 1*), define the various possible outcomes of the project along with probabilities of each occurring (for example probabilities of technical and commercial success). The resulting ECV is then divided by the constraining resource (as in the NPV method), and projects are rank-ordered according to this index in order to maximize the portfolio index. The method also approximates *real options theory*, and thus is appropriate for handling higher risk projects.



ECV=[(PV*PC-CC)*PT-DC]

PC=Probability of Commercial Success (given technical success)
DC=Development Costs remaining in the project
CC=Commercialisation (Launch) Costs
PV=Present value of project's future earnings (discounted to today)
PT=Probability of Technical Success
ECV=Expected Commercial values of the project

The project is broken into stages in decision-tree format.

Outcomes, consequences and probabilities are shown in the fig.

To calculate the ECV, follow the link from PV on the right to ECV on the left.

Figure 1: Calculation of expected commercial value of project

Step 3. Prioritizing and Balancing: The third major area of portfolio management is the development and selection of the project portfolio. The questions to ask are: Which projects should be selected? How does the project relate to the entire portfolio, and how can the project mix be optimized? Several things need to be considered: Establish a process that will help optimize the portfolio not just the individual projects. Establish port- folio decision meetings to make decisions.

Seek Balance in Your Portfolio: Here, the goal is to achieve a desired balance of projects in terms of a number of parameters; for example, long term projects versus short ones; or high risk versus lower risk projects; and across various markets, technologies, product categories, and project types (e.g., new products, improvements, cost reductions, maintenance and fixes, and fundamental research). Pictures portray balance much better than do numbers and lists, and so the techniques used here are largely graphical in nature. These include:

- *Scoring model:* Decision-makers rate projects on a number of questions that distinguish superior projects, typically on 1-5 or 0-10 scales. Add up these ratings to yield a quantified project usefulness score, which must clear a minimum hurdle. This Score is a proxy for the "value of the project" but incorporates strategic, leverage and other considerations beyond just financial measures. Projects are then rank-ordered according to this score until resources run out. A typical scoring scheme is shown in *Figure 2*.

IGNOU					SCORING TABLE			
Criteria	Scores weight	Partition	Rapid part	Growth	Sequence	Average Score	Weight	Weight age
Strategic alignment								
Production business limit	7	8	6	8	8	7.5	5%	12.4
Product manufacturing	7	9	7	6	7	7.6	6%	5.6
Product support	7	8	6	7	6	7.3	7%	6.3
Product Knowledge								
Customer needs	8	7	7	5	7	7.6	12%	5.6
Product preparation	8	7	8	5	5	7.4	8%	5.3
Market Effectiveness								
Market criteria	9	8	8	4	8	7.6	7%	3.7
Market policy	8	6	6	7	8	7.2	5%	6.2
Risk								
Types of risks	8	8	5	7	8	7.6	6%	9.1
Affect of risk	6	6	4	6	9	7.3	9%	5.8
						Total	100%	75.7

Figure 2: Scoring Table: The worksheet computes the average scores and applies the weighting factors to compute the overall score

- *Bubble diagrams:* Display your projects on a two-dimensional grid as bubbles as in *Figure 3*. The axes vary but the most popular chart is the risk-reward bubble diagram, where NPV is plotted versus probability of technical success.

  Then seek an appropriate balance in numbers of projects.

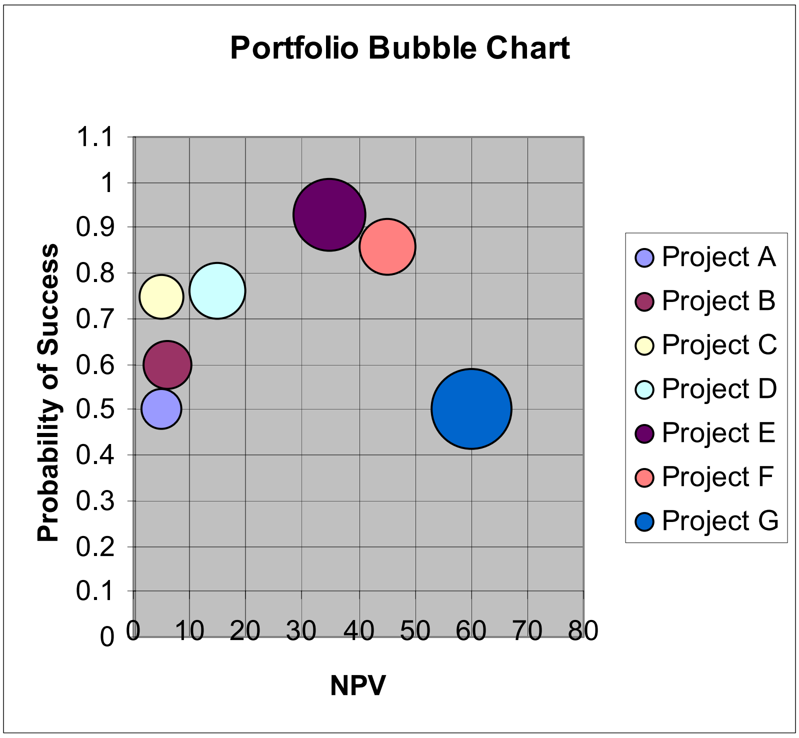


Figure 3: Bubble diagram

The bubble diagram provides a graphical view of the project portfolio risk-reward balance. It is used to assure balance in the portfolio of projects — neither too risky nor conservative and appropriate levels of reward for the risk involved. The horizontal axis is Net Present Value, the vertical axis is Probability of Success. The size of the bubble is proportional to the total revenue generated over the lifetime sales of the product (for working out cost impact, the size of the bubble is made proportional to the cost of the project).

• *Pie charts: Figure 4* shows spending breakdowns as slices of pies in a pie chart. Popular pie charts include a breakdown by project types, by market or segment, and by product line or product category.

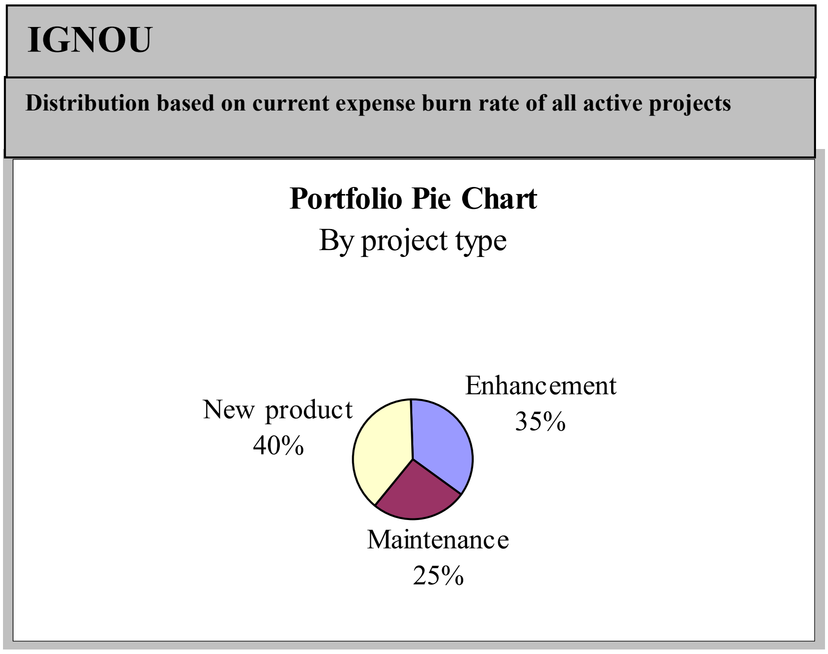


Figure 4: Pie chart for spending breakup

While this visual presentation is useful, it can't prioritize projects. Therefore, some mix of these techniques like, bubble chat along with pie chart etc. is appropriate to support the Portfolio Management Process. This mix is often dependent upon the priority of the goals.

Both bubble diagrams and pie charts, unlike the maximisation tools outlined above, are not decision-models, but rather *information display*: they depict the current portfolio and where the resources are going – the 'what is'. These charts provide a useful beginning for the discussion of 'what should be' – how should your resources be allocated.

A final check is to analyse product and technology roadmaps for project relationships. For example, if a lower priority platform project was omitted from the portfolio priority list, the subsequent higher priority projects that depend on that platform or platform technology would be impossible to execute unless that platform project were included in the portfolio priority list.

Balancing

It is very important that the Right Number of Projects are picked. Most companies have too many projects underway for the limited resources available. The result is pipeline gridlock: projects end up in a queue, they take too long to reach the market, and key activities – for example, doing the up-front homework – are omitted because of a lack of people and time. Thus, an over-riding goal is to ensure a balance between resources required for the active projects and resources available. Here are the ways:

• **Resource limits:** The value maximization methods build in a resource limitation – rank your projects until out of resources. The same is true of bubble diagrams the sum of the areas of the bubbles – the resources devoted to each project – should be a constant, and adding one more project to the diagram requires that another be deleted.

- **Resource capacity analysis:** Determine your resource demand, prioritise your projects (best to worst) and add up the resources required by department for all active projects (usually expressed in person-days per month). Project management software, such as MS-Project, enables this roll-up of resource requirements. Then determine the available resources (the supply) per department – how much time people have to work on these projects. A department-by-department and month-by-month assessment usually reveals that there are too many projects; it suggests a project limit (the point beyond which projects in the prioritized list should be put on hold); and it identifies which departments are the bottlenecks.

Decision Gates Process

Right from the first stage, the elimination of projects which do not meet the requirements of that step are required to be eliminated. This process of removal or delaying of projects is carried out by decision gates (*Figure 5*). The process chain for decision-based monitoring and reporting includes the following **decision points or gateways**, each of which requires associated reports.

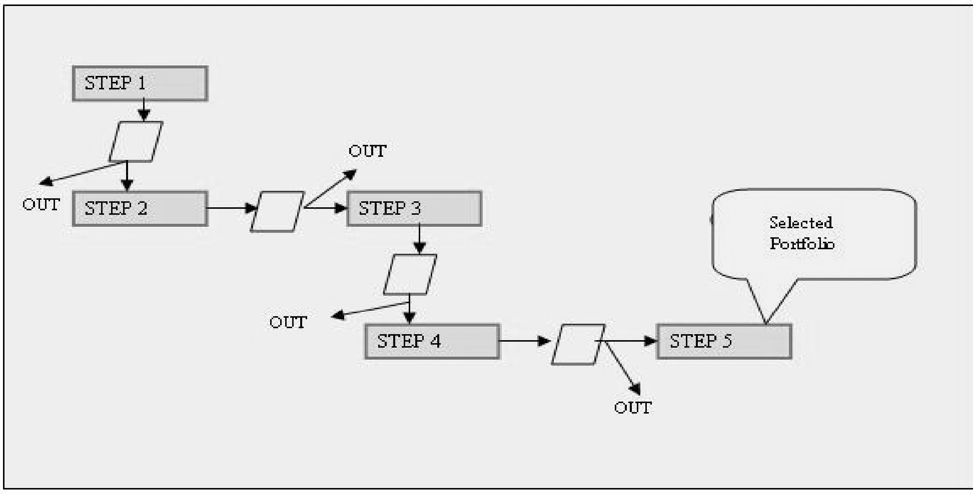


Figure 5: Decision step gates

1) **At the Data Gathering stage:** After **pre-screening** has taken place, project ideas are subjected to a selection process designed to filter out ideas with little potential. The remaining project ideas are only then evaluated as to their cost-effectiveness and classified as must-do or can-do projects. In the next step, high-potential ideas are developed into business cases and fleshed out. Ideas that seem unattractive at this point fail to pass the gateway and are rejected. The project ideas are presented in an overview showing how they fulfill the above criteria; this helps decide which ideas pass the gateway and which should be rejected.

2) **At the Evaluation stage: Project dependencies** must be evaluated to pinpoint dependencies within and between strategic buckets. (Defined top-down, strategic buckets represent areas of strategic focus and spending splits, and each project is assigned to just one bucket). This helps to pinpoint potential synergy. Any redundancies must then be eliminated by reconfiguring projects and by creating programs of projects. For this purpose, dependencies must be evaluated and presented in visual form to assist with decision-making.

3) Company-internal billing is based on rates set by the organisational units involved. Due to differing cost structures and fluctuating demand, **internal billing rates** must be reviewed regularly. Once capital constraints have been determined, supply and demand for specific resources must also be determined. Internal billing rates between organisational units can be recalculated on the basis of actual resource costs. This requires information on resource supply and demand as well as the underlying costs of the resources.

4) **Prioritisation:** Projects should be assigned priorities based on their perceived value, and a project ranking system must be developed. Project value can be either quantitative such as net present value, expected commercial value, return on investment, etc or qualitative such as strategic contribution, operational urgency, strategic alignment, risk, etc. Project value information is presented in the form of a score table or graphical chart, enabling decision-makers to evaluate the project portfolio using a wide variety of criteria. This leads to a more balanced assessment.

5) **At the Approval stage:** Following prioritization, the **project portfolio** is finalized. Based on the comparison and evaluation of quantitative and qualitative criteria relating to strategic importance, value and risk, a concrete scenario is selected for implementation. Decisions must be made as to which projects to execute, continue or cancel. To this end, alternative scenarios are compared using the above criteria. A change list must also be drafted, stating which projects are to be started, continued, postponed, brought forward, or abandoned.

6) Once a portfolio has been selected for implementation, the **allocation of resources** must be determined. The selected scenario dictates how resources need to be allocated to organisational units, and determines whether and what additional capacity (in-house and external) is required. An evaluation of how the selected portfolio affects resource availability and allocation is provided as decision-support.

7) The project portfolio selected also drives the **allocation of capital**. The scenario selected determines the investment required and the capital allocated to each organisational unit in the form of funding for in-house effort, outsourced effort, and investment. In addition, the budgets of the strategic buckets are reviewed and adjusted, providing baseline information for subsequent investment control/monitoring. An analysis of capital distribution is used as decision-support for approving the allocation of funds.

8) **At the Control stage: Analysis of deviations** is performed regularly while the projects in the portfolio are underway. Deviations are identified by comparing target and actual values; this method also provides information on their scale and severity. The project portfolio may require adjustment as a result. Decision-making on corrective action is facilitated by reports showing qualitative and quantitative parameters for the entire portfolio, and highlighting the impact of serious deviations from plans or targets.

Step 4 'WHAT IF' analysis and project adoption: Once the organisation has its prioritised list of projects, it then needs to determine where the cutoff is based on the business plan and the planned level of investment of the resources available. This subset of the high priority projects then needs to be further analyzed and checked. The first step is to check that the prioritized list reflects the planned breakdown of projects based on the strategic allocation of the business plan.

The *Figure 6* shows the portfolio adopter designed to let executives or project managers conduct 'what if' scenario modeling and analysis. This view shows a portfolio of projects (top left) and the dates the projects are scheduled to start and end (top right). The bottom half of the screen shows the impact on overall capacity of the firm to do them (bottom right). Users can adjust any portion to show the impact of delaying or canceling projects in the portfolio on capacity, money, marketing value.

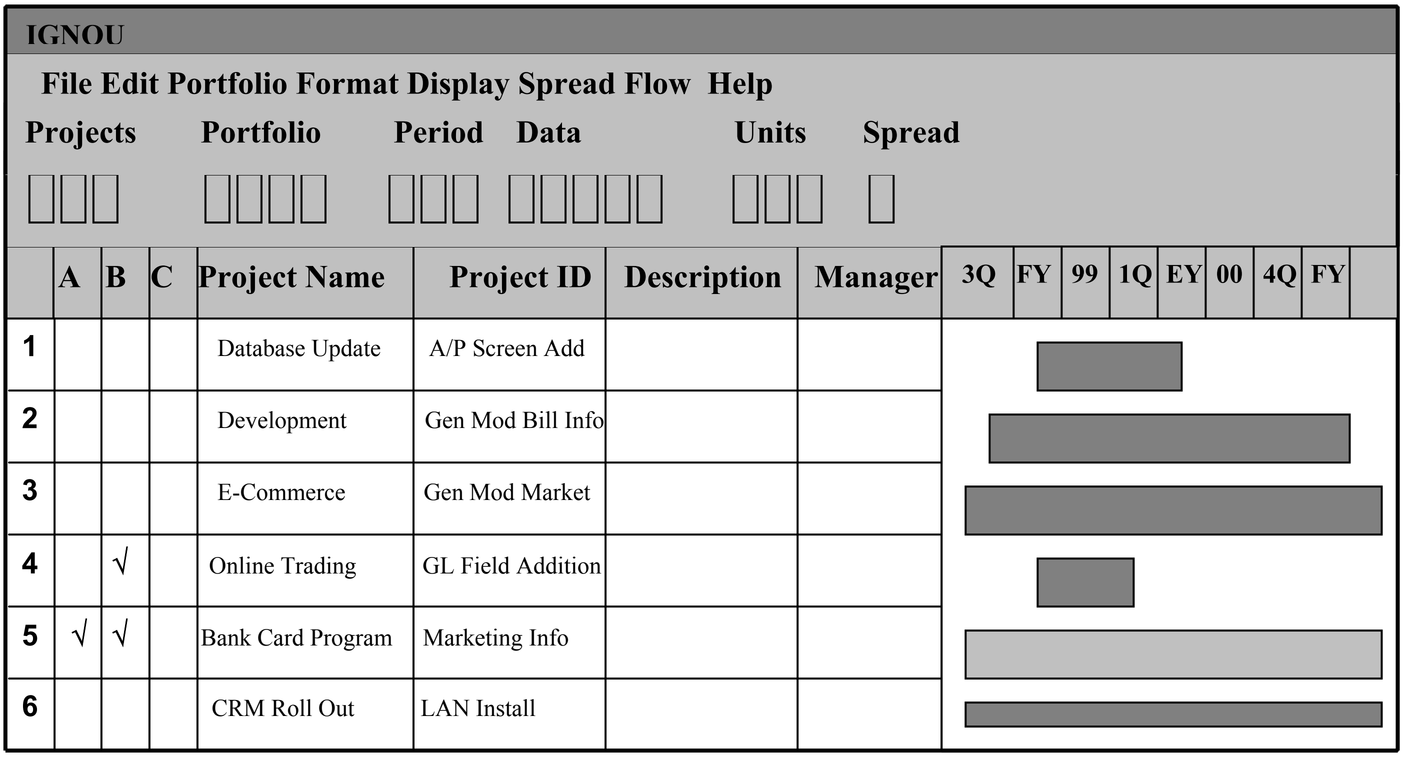


Figure 6: Portfolio adopter

The selected portfolio projects are taken up for implementation / continuation. However, the monitoring process has to continue. For this purpose most of the vendors are offering a dashboard as part of their software package. This dashboard presents an overall view as shown in *Figure 7*.

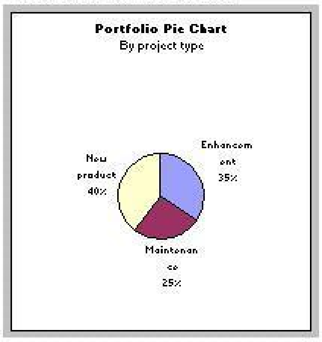
Overall Business

Strategic Allocation
Corporate of BU Level

	Technology Development	New Products	Enhancements & Line Exten.	Total
Business Unit A	7%	24%	4%	35%
Business Unit B	2%	16%	7%	25%
Business Unit C	0%	6%	11%	17%
Business Unit D	2%	14%	6%	22%
TOTAL	11%	60%	28%	99%

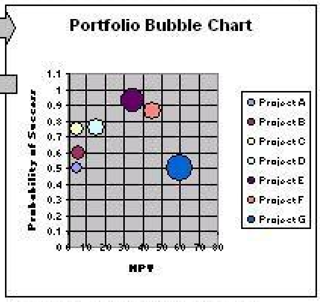
Master Project Schedule
Corporate of BU Level

Risk-Reward Bubble Chart
Project Type Pie Chart
Review to Ensure Balance



PROJECT NAME	Budget product line	P	S	NPV	DPS	Score
Description	Process	Remaining Cost	Profit Over life	R-Factor	Profit	
DVD POWER	Tech standard	Rs.2,223	Rs.29.5	Rs.53	Rs.92	90.8
HIGH SPEED	Indus Standard	Rs.3,205	Rs.41.5	Rs.21	Rs.84	86.9
MICRO PRODUCT	Tech Standard	Rs.4,105	Rs.43.5	Rs.32	Rs.74	78.3

Scorecard Method Development Productivity Index



Roadmap: Review to Consider
Technology & Platform Relationships

Figure 7: Overall view of portfalio management process

Check Your Progress 1

1) State True or False:

a) The portfolio management process eliminates need for Investment bundling, Prioritization, Evaluation and Decision insight and support. True ☐ False ☐

b) The portfolio management makes possible, grouping of technology, Investment Focus and cost control. True ☐ False ☐

c) **ECV = [(PV * PC - CC) * PT - DC]**

Where PC = Probability of Commercial Success,
DC = Direct Cost, CC = Commercialization (Launch) Costs,
PV = Present Value of project's future earnings (discounted to today),
PT = Probability of Technical Success and ECV = Expected Commercial Value of the project. True ☐ False ☐

d) Scoring Tables are used for prioritizing the portfolios. True ☐ False ☐

e) Bubble diagrams are used for prioritizing the portfolios. True ☐ False ☐

2) Answer the Following Questions:

i) What are the key functional requirements which must be available in the Portfolio Management Solution?

…………………………………………………………………………………
…………………………………………………………………………………
…………………………………………………………………………………

ii) What are the steps for portfolio management implementation?

…………………………………………………………………………………
…………………………………………………………………………………
…………………………………………………………………………………

1.5 RISK MANAGEMENT

With the Information Technology, although management needs to be aware of all potential risks, *operational risk* is the primary risk associated with it. Operational risk (also referred to as transaction risk) is the risk of loss resulting from inadequate or failed processes, people, or systems. The root cause can be either internal or external events. Operational risk is present across all business lines.

Operational risk may arise from fraud or error. Management's inability to maintain a competitive position, to manage information, or to deliver products and services can also create and compound operational risk. Weak operational risk management can result in substantial losses from a number of IT threats including business disruptions or improper business practices.

All organisations should properly identify, measure, monitor, and control operational risk. Management should distinguish the operational risk component from other risks to enable a stronger focus on operational risk mitigation. The board should ensure that a program exists to manage and monitor this risk. The program should address the institution's tolerance for risk, the effectiveness of internal controls, management's accountability in regards to risk mitigation, and the processes needed to manage IT effectively.

Operational risk includes not only back office operations and transaction processing, but also areas such as customer service, systems development and support, internal controls and processes, and capacity planning. Operational risk from IT also affects credit, compliance, strategic, reputation, and market risks. Management should be aware of the implications of operational risk including:

- **Liquidity, interest, and price risks:** Credit and market risks can materialize from external changes in markets, industries, or specific customers. Internal controls that rely heavily on the availability and performance of technology create additional operational risk exposure. For example, a failure to properly implement changes to underwriting, account management, or collection systems can lead to significant losses, and higher loan servicing and collection costs

- **Reputation risk:** Reputation risk stems from errors, delays, or omissions in information technology that become public knowledge or directly affect business partners, customers and consumers resulting in a loss of confidential information and potential customer withdrawal of funds. Two activities that can lead to reputation risk are the unauthorised disclosure of confidential customer information and the hacking/modifying of an institution's website

- **Strategic risk:** Strategic risk can stem from inaccurate information or analysis that causes management to make poor strategic decisions. For example, IT management could decide to save money by delaying an infrastructure upgrade to increase network bandwidth, which could result in a business line losing market share due to an inability to compete.

- **Compliance (legal) risk:** Compliance risk results from the institution's inability to meet the regulatory and legal requirements associated with its IT products and services. Legal risk may lead to civil or criminal liability if, for example, an institution discloses confidential information or provides inaccurate or untimely consumer compliance disclosures.

IT management should have a corporate-wide view of technology. It should maintain an active role in corporate strategic planning to align technology with established business goals and strategies. It also should ensure effective technology controls exist throughout the organisation either through direct oversight or by holding business lines accountable for IT-related controls. From a control standpoint, management should assess risks and determine how to control and mitigate the risks. Management should continually compare its risk exposure to the value of its business activities to determine acceptable risk levels.

IT Risk Management Process

IT controls result from an effective risk assessment process. Therefore, the ability to mitigate IT risks is dependent upon risk assessments. Senior management should identify, measure, control, and monitor technology to avoid risks that threaten the safety and soundness of an institution. The institution should

1) *plan* for use of technology,
2) *assess* the risk associated with technology,
3) decide how to *implement* the technology, and
4) establish a process to *measure and monitor* risk that is taken on. All organisations should have:
   - An effective planning process that aligns IT and business objectives;
   - An ongoing risk assessment process that evaluates the environment and potential changes;
   - Technology implementation procedures that include appropriate controls, and
   - Measurement and monitoring efforts that effectively identify ways to manage risk exposure.

This process will typically require a higher level of formality in more complex institutions with major technology-related initiatives.

The risk identification and management process for technology-related risks is not complete without consideration of the overall IT environment in which the technology resides. Management may need to consider risks associated with IT environments from two different perspectives:

- If the IT function is decentralized, and business units manage the risk, then management should coordinate risk management efforts through common organisation-wide expectations.
- If the IT department is a centralised function that supports business lines across shared infrastructure, management should centralize their IT risk management efforts.

Planning IT Operations and Investment

Planning involves preparing for future activities by defining goals and the strategies used to achieve them. Information technology is an integral part of large number of companies like financial institution operations. Therefore, such companies like, financial institutions should integrate IT resources and investments into the overall business planning process. Major investments in IT resources have long-term implications on both the delivery and performance of the institution's products and services.

Plans may vary significantly depending on the size and structure of the organisation. Every organisation should strive to achieve a planning process that constantly adjusts for new risks or opportunities and maximizes the value of IT to the organisation. Management should always document plans; however a written plan does not guarantee an effective planning process. Management should measure specific plans by whether they meet the organisation's business needs. For all plans, the examiner should evaluate the process as well as the written product. A sound plan requires the board of directors, senior management, and user involvement in the planning process.

The board of directors should review and approve the plan. Senior management participates in formulating and implementing the plan. The individual departments and functional areas identify specific business needs and, ultimately, implement the plans.

Risk Identification and Assessment

Operational IT planning should identify and assess risk exposure to ensure policies, procedures, and controls to remain effective. Information security risk assessments are essential. The assessments should identify the location of all confidential customers and corporate information, any foreseeable internal and external threats to the information, the likelihood of the threats, and the sufficiency of policies and procedures to mitigate the threats. Management needs to consider the results of these assessments when overseeing IT operations.

The risk assessments should cover all IT risk management functions including security, outsourcing, and business continuity. Senior management should ensure IT-related risk identification and assessment efforts at the enterprise-wide level are coordinated and consistent throughout the organisation. A strong, high-level, risk assessment process provides the foundation for more detailed assessments within the functional risk management areas. An effective IT risk assessment process will improve policy and internal controls decisions across the organisation.

Senior management can use risk assessment data to make informed risk management decisions based on a full understanding of the operational risks. Small institutions with less complex systems may have a more simplified risk assessment process. Regardless of the complexity, the process should be formal and should adapt to changes in the IT environment. Examiners should measure the effectiveness of the process by evaluating management's understanding and awareness of risk, the adequacy of formal risk assessments, and the effectiveness of the resulting policies and internal controls.

Ongoing Data Collection

Understanding the institution's environment is the first step in any risk assessment process. Senior management should incorporate information on IT issues such as resource limitations, threats, priorities, and key controls from several sources. In developing a formal risk assessment, management should collect and compile information regarding the organisation's information technology environment from several locations including:

- IT systems inventories are critical to understanding and monitoring the tactical operations of the institution's information technology as well as to identifying the access and storage points for confidential customer and corporate information.
- IT strategic plans provide insight into the organisation's planning process. Review and analysis of the strategic plans as part of the risk assessment process may spotlight developing risk exposures or other deficiencies that limit the institution's ability to implement strategic priorities.
- Business recovery and continuity plans prioritise the availability of various business lines to the institution and often encompass restoration and provision of control, customer service, and support. The plans can offer insight into the organisation's critical operating systems and the control environment.
- Due diligence and monitoring of service providers can present valuable information on the servicer control environment. The information is necessary for a complete risk assessment of institution's information technology environment.

- Call center issue tracking reports can often indicate potential performance or control issues if the problem reports are aggregated and analysed for repetitive or common issues.
- Department self-assessments on IT-related controls can provide early identification of policy noncompliance or weaknesses in controls.
- IT audit findings provide insight into the veracity and responsiveness of the institution's staff and management, commitment to policy compliance and internal controls.

Risk Analysis

Management should use the data collected on IT assets and risks to analyze the potential impact of the risks on the institution. The analysis should identify various events or threats that could negatively affect the institution strategically or operationally. Management should evaluate the likelihood of various events and rank the possible impact. Some examples of events that could affect the institution include the following:

- **Security breaches:** Security breaches that can affect the institution include external and internal security breaches, programming fraud, computer viruses, or denial of service attacks
- **System failures:** Common causes of system failures include network failure, interdependency risk, interface failure, hardware failure, software failure, or internal telecommunication failure
- **External events:** Institutions are also exposed to external threats including weather-related events, earthquakes, terrorism, cyber attacks, cut utility lines or wide spread power outages that bring about system or facility failures.
- **Technology investment mistakes:** Mistakes in technology investment including strategic platform or supplier risk, inappropriate definition of business requirements, incompatibility with existing systems, or obsolescence of software may constrain profitability or growth.
- **Systems development and implementation problems:** Common system development and implementation problems include inadequate project management, cost/time overruns, programming errors (internal/external), failure to integrate and/or migrate successfully from existing systems, or failure of system to meet business requirements.
- **Capacity shortages:** Shortages in capacity result from lack of adequate capacity planning, including the lack of accurate forecasts of growth.

Once the institution has identified the universe of risks, management should estimate the probability of occurrence as well as the financial, reputation, or other impact to the organisation. Organisational impacts are highly variable and not always easy to quantify, but include such considerations as lost revenue, flawed business decisions, data recovery and reconstruction expense, costs of litigation and potential judgments, loss of market share, and increases to premiums or denials of insurance coverage. Typically, risk analysis ranks the results based on the relationship between cost and probability.

Prioritisation

Once management understands the institution's technology environment and analyzes the risk, it should rank the risks and prioritize its response. The probability of occurrence and the magnitude of impact provide the foundation for reducing risk exposures or establishing mitigating controls for safe, sound, and efficient IT operations appropriate to the complexity of the organisation. The overall risk assessment results should be a major factor in decision making in most IT management responsibility areas including:

- Technology budgeting, investment, and deployment decisions
- Contingency planning
- Policies and procedures
- Internal controls
- Staffing and expertise
- Insurance
- IT performance benchmarks
- Service levels for internal and outsourced IT services and
- Policy enforcement and compliance

Monitoring

Management and the board should monitor risk mitigation activities to ensure if identified objectives are complete or are in process. Monitoring should be ongoing, and departments should provide progress reports to management on a periodic basis. Ongoing monitoring further ensures that the risk assessment process is continuous instead of a one-time or annual event. Key elements of an effective monitoring program include:

- Mitigation or corrective action plans;
- Clear assignment of responsibilities and accountability, and
- Management report.

IT Controls Implementation

These guidelines are applicable to both in-house and external provider situations.

Policies, Standards, and Procedures

Management should adopt and enforce appropriate policies and procedures to manage technology risk. The effectiveness of these policies and procedures depends largely on whether they are used by internal staff and vendors. Testing compliance with these policies and procedures often helps to identify and correct problems before they become serious. Clearly written and frequently communicated policies can establish clear assignments of duties, help employees to coordinate and perform their tasks effectively and consistently, and aid in the training of new employees. Senior management should that ensure policies, procedures, and systems are current and well documented

Internal Controls

The institution should adopt adequate controls based on the degree of exposure and the potential risk of loss arising from the use of technology. Controls should include clear and measurable performance goals, the allocation of specific responsibilities for key project implementation, and independent mechanisms that will both measure risks and minimize excessive risk-taking. Management should re-evaluate these controls periodically.

Management practices associated with general controls include:

- Reporting effectiveness to the Board of Directors;
- Periodic review and updating of policies, standards, and practices;
- Regular review of internal and third party audit results;
- Review of service level agreements, and

- Review of control metrics including issues and corrective action plans.

Adequate internal controls should be structured to assure senior management that:

- Personnel create, transmit, and store records and transactions in a safe and sound manner;
- Adequate segregation of duties exists;
- MIS data are reliable and the reporting cycle is adequate;
- Necessary Quality Checks have been implemented;
- Operating procedures are efficient and effective;
- Procedures are in effect to assure continuity of business;
- The institution identifies and monitors high-risk conditions, functions, and activities, and
- There is proper adherence to management standards and policies, applicable laws and regulations, regulatory statements of policy, and other guidelines.

Independent audits can verify that these controls exist and are functioning effectively.

Personnel

All organisations should mitigate the risks posed by IT staff by performing appropriate background checks and screening of new employees. In addition to staff, the controls in this section are relevant for vendor personnel, consultants, and temporary staff that support the IT function. Typically, the minimum verification considerations include:

- Character references;
- Background checks including confirmations of prior experience, academic credentials, professional qualifications, or criminal records, and
- Confirmation of identity from government issued identification.

Insurance

In establishing an insurance program, management should recognise its exposure to loss, the extent to which insurance is available to cover potential losses, and the cost of such insurance. Insurance programs should be commensurate with the complexity and risk of each institution. Management should weigh these factors to determine how much risk the organisation will assume directly. In assessing the extent of that risk, institutions should analyse the effect of an uninsured loss on themselves and any affiliates or parent companies. Management should also review a company's financial condition and/or credit rating reviews when deciding on an insurance company. Once management has acquired appropriate insurance coverage, it should establish procedures to review and ensure its adequacy. These procedures should include, at a minimum, an annual program review by the board of directors

1.6 DISASTER MANAGEMENT

A disaster is defined as a sudden misfortune that is ruinous to an undertaking. This means that there is little time to react at the time of the misfortune. Preparations are required to have been made in advance. The focus should, therefore, be on disaster planning.

The first step in disaster planning is to **assess risk.** A computer or network disaster typically involves loss of or damage to data, the inability of programs to function, or the loss of data communication. Risk assessment answers the question, what is the probability a particular disaster to occur and how serious will be the effect likely to be if it does occur. Among the disasters that should be assessed are natural disasters such as floods, fires, and earthquakes and manmade disasters such as air conditioning failures, viruses, hacking, and vandalism. The line between the two is not clear-cut because a flood can be the result of vandalism to a water pipe and a fire can be deliberately set as an act of vandalism.

A risk assessment matrix should be created, one which puts the probability on one axis and the effect on the other, with the risk factor fixed by the combination of the two factors:

Effect may be classified as Major, Moderate, and Minor. Probability of Risk may be classified as High 5 4 3 Moderate 4 3 2 and Low 3 2 1 on a 5 point scale.

A risk factor of 5 requires much more attention and warrants a much greater outlay of resources than a risk factor of 1.

The risk factor will vary by area of the country, nature of the community, and type of organisation. In much of California, earthquakes would be rated a risk factor of 5; along the flood plains of the Mississippi River flooding would be a risk factor of 5. Viruses, while probable, usually have only a minor effect, therefore, they would have a risk factor of 3. Hacking, this rates highly probably for Fortune 500 companies; rates low for smaller organisations, but may rate a risk factor of 3 because its effect may be major. In many areas floods are likely to be the result of a broken pipe and have a low risk factor of 1 or 2 because their effect tends to be localized and, therefore, minor or moderate.

The second step in disaster planning is **risk reduction**. This is achieved by lowering the risk factor by reducing the probability, reducing the effect, or both. For example, while no disaster plan can reduce the probability of an earthquake, housing the organisation in California that is quake-resistant should reduce the effect of one. Placing a computer room where there are no overhead pipes reduces the probability of flooding; rack-mounting the computer hardware so that it is several inches above the floor reduces the effect. Installing anti-virus software reduces the probability of a disaster; regularly backing up all data reduces the effect.

The third step in disaster planning is to earmark resources. Disaster planning need resources (takes time and expertise), but it is within the means of most organisations. A small task force of staff members, given time to read the literature and contact other organisations that have done disaster planning, can develop a disaster plan in weeks or months. What is difficult for many organisations is finding separate funds to carry out the plan. Retrofitting an old building to withstand earthquakes can cost hundreds-of-thousands or millions of dollars; mirroring a database of a large organisation can cost huge amount of money. Each risk factor must, therefore, have a price tag associated with it. An organisation has to decide whether the risk reduction is worth the price and, if so, seek the funds to pursue the risk reduction.

It may not be realistic to lower the highest risk factors first because the funds may not be available. It may be necessary to focus on lowering risk factors for which the resources are available. Heat/smoke and water detectors are within the means of most organisations and should not be skipped over just because the risk factor is not a 4 or 5.

The fourth step in disaster planning is to identify Common Disaster Plan Elements. Every disaster plan should set forth both preventive measures and remedies in at least the following areas:

Servers

Every organisation with one or more servers should have a server room that is secured with a combination lock such as a Simplex and a reinforced door with a deadbolt at least 1.5 inches long. If the room is not windowless, the windows should be barred. The room should have both fire/heat detection and water detection sensors which set off a local alarm and send a signal to an off-premises monitoring facility. At a minimum, it should have fire extinguishers suitable for electrical fires. An organisation that has hundreds-of-thousands of dollars in equipment in its server room should consider a built-in fire suppression system.

Excess heat is, by far, the most commonly reported cause of server downtime and damage. An office should, therefore, augment its building air conditioning with a room-size air conditioner that kicks-in only when its thermostat shows that the temperature in the room has risen above a office specified level, typically 68 degrees. An additional safeguard is available, a thermostat inside any cabinet which has a cooling fan. When a fan fails and the temperature rises, an alarm should be triggered.

Water damage is the second-ranking cause of server downtime and damage, although the damage is rarely greater than moderate. There should be no water pipes in the ceiling above the room, or in the walls that enclose it. The server(s) and associated peripheral equipment should be rack-mounted so that up to six inches of standing water will not affect the equipment.

Power irregularities are the third-ranking cause of server downtime and damage. An UPS (uninterruptible power supply) should be used to protect all servers against surges, spikes, brownouts, and blackouts. The UPS should have a rating which is it least twice the total KVA requirements of the devices it protects. KVA (Kilo Volt Amperes) is a rating that is calculated by multiplying the number of volts by the number of amperes and dividing by 1,000. While a office may not want to operate its servers on battery back-up for an extended period, the UPS should provide power long enough for an orderly shutdown of all servers.

The database server should be protected by its own firewall, preferably a proxy-server between it and the Web server on which the patron access catalog is mounted. A proxy server shields the database server from direct access by initiating a separate inquiry, rather than passing the external inquiry through to the database server. The firewall can be on the same hardware platform as the database server. The Web server can support not only the patron access catalog, but also other files and a gateway to electronic resources outside the organisation. It should include remote patron authentication software so that access to other than records the organisation wishes to make available to everyone is limited to those who are authorized users.
Each server should be configured with a logging tape drive--typically a 4mm or 8mm streaming tape drive-- so that all information written to disk is also written to tape. Each evening the logging tape should be removed and stored away from the server room and a new tape mounted for database back-up. Overnight, the content of the disk drives should be written to tape. The next morning, the back-up tape should be removed and stored away from the server room and a new tape mounted for logging that day's transactions. It will then be possible to restore all files using the most recent back and logging tapes. Magnetic media can become unstable with repeated use, therefore, seven logging tapes--one for each day of the week--should be used. Seven back-up tapes should also be used. All of the tapes should be replaced at least every year.

An organisation may choose to do a back-up only once a week. If so, all of the logging tapes for the week should be saved so that they and the previous week's back-up tape can be used to restore the files. The logging tapes and the previous week's back-up tape should be stored away from the server room. In a large facility than may be at the opposite end of the building, but for smaller facilities it should be off-site.

At least once per week, a current back-up tape should be sent to an off-site storage facility to protect against the loss of the on-site back-up tape.

Organisations that can afford RAID (Reduced Array of Inexpensive Disks) should configure their servers with them. RAID technology mirrors everything written to one disk on another disk. If a disk fails, the mirroring disk provides access to the information without resorting to the rebuilding of files from the combination of back-up and logging tapes.

Network

An organisation can do a great deal to secure a LAN (local area network), but only a limited amount to secure a WAN (wide area network). The former usually is limited to a single building or part of a building; the latter usually ties two or more LANs together using a telco or other common carrier's circuits. The telco or common carrier has the responsibility for its portion of the WAN. Wan should be protected there appropriate firewalls.

The preferred LAN topology is a hybrid star, one that has several central star network points linked in a star. In other words, several desktop clients are connected to a hub, and several hubs are connected to yet another hub. The cabling from the desktop clients to the hubs can be relatively inexpensive Category 5 UTP (unshielded twisted pair); the wiring among hubs should be STP (shielded twisted pair) or fiber optic to dramatically improve performance and security.

Network hardware should be secured in locked data communications closets or cabinets. All data jacks should be capable of being de-activated when no office equipment is connected to them. The practice of distributing a large number of data jacks around a building for use by patrons with laptops should be avoided unless these jacks are on a separate LAN segment that can be isolated from the database server of the automated office system. Patrons need access only to the patron access catalog, and possibly to other servers: Web, Internet, CD-ROM, image, etc.

If a wireless LAN is implemented, it should access only a segment of the office's LAN, one that can be isolated from the database server of the automated office system.

The most vulnerable part of a office's network is the connection to the Internet, both access from the Internet to its servers and from its servers and clients to the Internet. Fortunately, it is cost effective to protect a office's database server with its own firewall so that there is protection against in-office users, as well as external users. More vulnerable are the other servers and the clients or desktop workstations. Most offices seek to protect them only from users outside the office. This can be done by installing a network firewall. The firewall can be configured not only to restrict access to specific categories of users or specific types of queries, but can also be configured to facilitate access to office-selected resources.

Clients

PCs and Macs are the most vulnerable technology in offices because they can be compromised by staff and patrons who behave unwisely by downloading attachments or bringing in software and data disks from outside the office. Viruses are the greatest threat. An Anti-virus software is absolutely essential. Products from companies such as McAfee and Norton detect computer virus signatures and alert the user to them before they enter the client; however, anti- virus products are of little value if they are not regularly updated. Literally hundreds of new viruses are unleashed every week, therefore, anti-virus software should be updated at least weekly by downloading the latest version.

Almost all viruses travel via e-mail attachments or diskettes. Staff should, therefore, be instructed not to open an attachment if the source of the e-mail is not known or the attachment is not expected. They should be particularly suspicious of attachments with strange-sounding titles. When in doubt, the sender should be asked by return e-mail to describe the contents of the attachment. Staff should be instructed not to bring software from home for loading on office machines, nor to carry diskettes back and forth between home and work machines.

The fifth step in disaster planning is to establish Recovery Procedures. It is important to state in the disaster plan not only what recovery procedures are to be followed if a disaster occurs, but also who has what responsibility. Who calls whom and what information should they be prepared to give? Who performs the needed diagnostics? Who restores the files? What are the instructions for packing and shipping the corrupted files?

Communication is of great importance during a disaster. It should not be assumed that regular telephone service will be available. Key personnel should have cell phones for use when regular telephone service fails or is overloaded. The cell phone in the server room should be stored in a wall-hung watertight cabinet on the wall adjacent to the entrance door. The instructions for dealing with a computer/network disaster should be stored in the same cabinet. All important telephone numbers should be stored in each cell phone. If a disaster affects more than the office, the cellular service may be swamped with calls. It is, therefore, a good idea to instruct the operator in the server room to use the redial and speaker features of the regular telephone while seeking to get through on the cell phone.

A designated operator for each hour the office is open is a good practice. This may be a member of the circulation desk's support staff ,the staff which usually is in the office all of the hours the office is open. The designated person would perform the end-of-day swap of the logging and back-up tapes as part of his/her routine duties. Otherwise, s/he would leave her/his regular duties only when there was a problem.

The designated operator on duty at the time of a disaster should have instructions to call the support desks for the servers that have been affected. The numbers should be encoded in both the server room's telephone and the cell phone that has been provided as a back-up.

Each designated operator should participate in an occasional disaster drill that simulates an actual disaster that affects one or more servers.

Designated manager to support the designated operator who may encounter a situation that overwhelms him/he should also be considered. There should always be a designated manager in the office or available by telephone 24 hours per day, seven days per week. While there may rarely be a need to decide about evacuation of the office or another major action, the capacity to do so must be in place.

An external resource is the vendor of an automated office system is an important resource in diagnosing problems that result from a disaster. When drawing the contract, make it clear that the vendor shall be liable not only for the performance of the central site and its client software, but it shall undertake remote diagnostics through the network to the desktop. In other words, it shall pinpoint a problem regardless of where it is. If coverage has not been purchased for 24 hours a day and seven days a week, there should be provision for emergency support at agreed upon hourly rates outside the normal coverage hours.

If the database server for the automated office system is affected by a disaster, the vendor's trouble desk should be called so that remote diagnostics can be performed and guidance can be obtained. If the vendor of the automated office system is not responsible for the management of hardware maintenance, hardware problems should be referred to the manufacturer's support desk.

Sources of support for all other servers should be identified and their telephone numbers must be encoded in the server room's telephone and in the cell phone that have been provided for back- up.

Most offices do not have the luxury of a network specialist. A office should, therefore, rely on the networking staff of a parent organisation or consider contracting with a network support service for remote diagnostics and recovery assistance. While these firms are found in most major cities, a regional or national firm with experience in automated office systems should be considered.

One or more data recovery firms should be identified. These firms recover data from hard drives, diskettes, or any other storage medium that has been damaged by flood, fire, physical impact, or a virus. A large national firm usually is able to accommodate a rush order better than a smaller local one.

Insurance coverage for disaster is part of the insurance plan by larger organisations. The office should carry insurance that includes coverage for its servers, network, and clients. In order to make claims, it is essential to have an absolutely current inventory of all hardware and software, including purchase data and price. A copy of this information should be stored at a remote site.

In case of damage that is visible, photographs should be taken promptly after the disaster to substantiate an insurance claim.

1.7 PORTFOLIO MANAGEMENT ISSUES AND CHALLENGES

In implementation of a portfolio management application, there are many successes associated with it, there are many lessons learned also. Issues and challenges which need to be understood are:

1) **Portfolio Management system acceptance**

Since true success of portfolio management system lies in active involvement of all concerned, it is important that the system's benefit are recognized and appreciated by them. The application champion (business side and application administrator) for this purpose may find themselves constantly 'selling the benefit' of the tool. They may need to become evangelist for portfolio management and have the stick-to-it-ness to weather the storm. Resistance may be strong and critics will most likely outnumber advocates. They will need to continually prove the value of the application and its data. This is not easy, it is not pretty, and it will become frustrating. This may also require doing some behind the scenes magic to prove that the application has value.

There will also be a significant training and learning curve. Even if the organisation is mature in its artifacts, processes, methodology, and terminology, there will be a new means of recording and reporting it.

2) **Real Time Readiness**

In the past, a project manager had control over when information about the project was shared and available for all members of the project team and for executives. The project manager could masks blemishes and possible lapses by controlling when information was shared. For example, if the project manager led a project status call every other Thursday, they could possibly wait until Wednesday night to update their issues report. If an issue was due a week before, the report might not get updated until before the review. Now with a portfolio management system, the day the issue becomes past due it can be flagged in reports. The PM might now have to do daily management of the issues.

3) **Conformity to override Flexibility**

One of the benefits of a portfolio management system is the ability to track information consistently across projects. Latest maturity models call for consistency across the organisation. A portfolio manager enforces conformity and an individual PM will loose some of the flexibility they have in tracking and reporting project status. For example using issues again, a PM might want to have a way to indicate an issue is resolved prior to being closed. This way they could have a report that shows issues 'resolved' and ready to go off the list. Another project manager may be more of the mindset that it goes straight to closed. People can refer to a closed issues report to see what's been closed in the past week. While we can not say which method is better, a portfolio management issues workflow will force the process. If a program manager wants to have consistency in reporting of all projects across the portfolio, an individual will need to sacrifice some of their individual style to conform to the portfolio work flow.

4) **System to be for the Users**

As you take project management from desktop applications and non-integrated artifacts, you have risen to the level of application management. With application management, comes the entire cycle of enhancement requests, workflow requests, and even field names. A PM might not get the feature he/she wants – or may have to compromise.

5) **Requirement of an Application Administrator**

First thing to do when implementing a portfolio management system is to appoint an application administrator and an application change control process. We need to budget a person's time into the care and feeding of this application. There is no rule of thumb regarding how many Full Time Equivalents (FTE's) are required for application administration, but it will have a direct relationship to the organisational maturity, the business process maturity, and the breadth of the audience. In one of the organisation where PM was implemented, workgroups was brought onto the Portfolio Management Application involved new people, new business model, Beta applications, and new customers. This group ended up with an application administration team that looked at the business request and two trained administrators that did the physical administration (defining views, reports, filters, adding users, creating work flows etc.) There were also two team members who looked at templates and business needs and helped set priorities with the application administrators. Application administration is a different responsibility than a system administrator or a data base administration. An application administrator needs a strong skill set balanced between knowledge of project management principles and methodologies, knowledge of the business, and technical knowledge of data bases, SQL, report writing, and trouble shooting. A system administrator focuses on making sure the operating system and the hardware work, the application administrator makes sure the application meets the business need. The organisation may head for failure if it is thought that a system administrator can provide the business needs fulfilled by an application administrator. Finally, there will be changes and churn on the application. It is going to need someone to manage those, train the users on changes, and prioritise the work. We can imagine many organisations under estimate the care and feeding needed to keep an application viable.

6) **Making it business management application requires sincere efforts by all**

Everybody has the best of intentions, but taking care of the low level minutiae that makes up a portfolio management system is cumbersome, time consuming, and some people may see it of little value. A basic premise of a portfolio application is that executive levels of information can flash from multiple projects at one time. However, to get that executive level, the lowest of details must be there and many project managers will not put it in, unless they are hounded to put it in, or they are 'punished' if they don't. Excellence is a mindset and the middle manager must maintain vigilance to insure compliance. There's an entirely integrated thread with this thought and that involves cross-organisational compliance so the portfolio management tool transcends a project management application and becomes a business management application. The impact, both cultural and technical, aspects of this concept are way to deep to cover in this thinking

7) **Reports grow exponentially if not reasoned out**

Input is one aspect of an application, output is another and there is an exponential demand for output. The main outcome of a well organised report is that there is always tendency to request for a new report or the same report with a 'slight modification'. We feel there is a way to stop this. The requests will continue to flow in and unless and until you reason out the and bring out new report only when there is genuine need for the same. However, it is difficult task to make people agree.

8) **People will Blame the System for their Own Lapses**

It is a rule of human nature. People will blame the system to hide their own insecurities and lack of knowledge. No matter what system is created, it will have its own set of idiosyncrasies and there will be some things the application will require that make no sense at all, but the application requires it. Be thick skinned and prepared for people to blame the system for their problems.

9) **Mental block**

No matter how much you train, hand hold, and evangelize, some people just won't get the idea of project rolling up to program, rolling up to portfolio. You may encounter resistance as to why do I need to do it this way? Portfolio management is a completely different perspective and does require a certain amount of abstract visualizing (is there any other type?) – some people who are Great silo-based project managers, will just not get the inter-dependencies of projects within a portfolio management system. While work with these people, one be careful and understanding, the odds are that they want to do well, and they have a wealth of knowledge and experience, but they have a mental block.

10) **Customisation efforts increase with time**

Every salesman who pushes a portfolio management system touts its flexibility and the capability to customize the system to meet your business need. Most give you the capability to add custom fields and create your own reports, but as stated earlier the demand for various outputs never ceases. In the infancy of the system you will be able to quickly add a custom field to meet a need, but after months of customization here and there, the ripple effect can be enormous.

1.8 TOOLS AND TECHNIQUES

The portfolio management tool market is growing: There are large numbers of vendors who are offering Portfolio Management Tools. Each vendor talks about the salient features of his tools and offers a variant method for the Portfolio. However, each vendor is offering automation of Portfolio process to some degree. Coordinating information across this portfolio management domain itself dictates a number of key product features that one should look for when considering a tool to assist with automating the portfolio management process. Three key requirements include:

- **Common repository**. A single data repository that each group will access for reporting will be a requirement for an organisation moving to full IT portfolio management. Multiple groups, each using separate tools and repositories, will quickly lead to inaccuracy and conflicts as data becomes out of sync.

- **Direct data collection and interchange**. Data should enter the portfolio management tools directly and without manual input. Requiring project managers to enter information for each project will also quickly lead to data corruption or omissions. Resource utilisation and project information should be gathered directly from project management systems and spending data fed into the system directly from financial management tools.

- **Configurable data views and portals:** Each user of the tool will have different requirements. When considering a portfolio tool, make sure that the interface is configurable for each user constituency, centralising common tasks and reports, and allowing for the addition of reports and functions as the portfolio management process grows, matures, and expands.

Given below is a **list of some of the major Commercial Portfolio Management tools** along with their vendor's name. A brief writ-up on the salient features of the tools offered by them is also given.

- **Business Engine Network by Business Engine Corp:** It is strongest in professional services automation, relies heavily on Microsoft Project for project management functions, offers good support for the IT budgeting process across multiple currencies. However, it could do a better job with opportunity management, particularly in the area of time and resource management.

- **The Edge for IT Pacific Edge by Software Inc:** It is strong in cost estimating, portfolio analysis, scenario planning and resource allocation, and has good reporting capabilities with Microsoft Project. It includes its own project and resource management tools. However, weak in terms of mapping internal workflow processes with the software. But the product allows an organisation to modify its work processes as they mature with its internal IT portfolio management methodologies.

- Legadero cadence Portfolios by Legadero Software provides everything you need to get a handle on all of your projects. This includes true Portfolio Management via approval process automation, information collection, metric-building and graphical decision support analyses and dashboards. All solutions are easy to evaluate, implement and learn.

- **MaestroTec (MaestroTec, Inc.):** By Maestro-EPM is a web-based solution that helps you manage project portfolios, resources, assets, work flow, and time and expenses.

- PlanView by PlanView Portfolio Management is a rich, integrated Web-native solution that helps organisations manage portfolios, projects, and resources. It is flexible enough to support the needs of small, medium, and large organisational models.

- **PortfolioDirector by Artemis International Solutions Corp:** Strong integration with Microsoft Project client, it has excellent user interface, and good time tracking and reporting and graph-generation capabilities. However, the standard product doesn't support calculation fields, making it tough to estimate overall resource requirements, such as the people, time and money needed for a project. An optional module adds this function.

- **PMOffice (Systemcorp):** This product is an Enterprise Project Portfolio Management solution that automates all your projects, people and priorities across the entire organisation. Companies can organize all projects into portfolios, and instantly track all project deliverables, budgets, tasks, changes, risks and issues from one central location.

- **Portfolio Management Solutions (Pacific Edge Software):** Pacific Edge solutions focus on three key areas of Enterprise Portfolio Management - IT, NPD, and Business Investment Portfolio Management, and allows for a multitude of investment types to be managed within each of these portfolios, such as: assets/applications, projects, products, and resources.

- **Project Activator:** Project Activator is a completely web based portfolio and project management software solution. It tracks active, pending, on hold and completed projects, completes document management, collaboration, project scheduling, resource allocation, budgeting, time tracking with internal and external customers. It has completely secure, Java and XML architecture. The Catalogue feature allows separation of projects by discipline, division, customer, project type.

- **Project InVision (Project InVision):** Project InVision software automates the essential business processes of portfolio analysis and project management.

- **Project Office:** Pacific Edge Softwares product, Project Office, provides a simple, painless way to manage project and resource information across an organisation and provides seamless integration to Microsoft Project for detailed planning and scheduling.

- **ProSight Portfolios Posited Inc:** Interoperates with other products such as Business Engine and its professional services automation capabilities. However, ProSight is more of a portfolio analysis tool than a portfolio management tool.

- **ProSight:** Only top-down portfolio management can deliver immediate value to your organisation. Using prosight portfolio management software, you can realized rapid buy-in and participation from executives and delivered immediate, tangible results—all without replacing existing software or processes. Best of all, ProSight's unique approach guarantees that any organisation can start managing any portfolio, immediately.

- **StatFrames Software Suite United Management Technologies Corp:** Strong in IT portfolio analysis and program management arenas, UMT is moving into portfolio management. StatFrames can identify internal processes. However, lacks asset management capabilities

- **TeamHeadquarters (Entry Software):** This product is a collaborative, browser-based software application combining project portfolio management (PPM), document management and helpdesk in one seamless application. This combination enables workgroups to manage all planned and unplanned initiatives from one integrated environment.

- **UMT:** Portfolio Management Solutions (UMT)- UMT software and consulting leverage 14 years of portfolio management expertise with Global 500 companies to align IT investments with quantifiable business drivers and justify IT spend. Enterprise solutions incorporate Efficient Frontier modeling to determine the optimal mix of initiatives, budget allocation, and skilled resources, while maximizing value and ensuring IT Portfolios execute business strategy.

1.9 EMERGING TECHNOLOGIES

In the Emerging Technologies three key technology themes (as per Gartner) are expected to be having significant growth and need to be watched: (a) Technologies that will enable the development of Collaboration, (b) Next Generation Architecture, and, (c) Real World Web.

a) **Collaboration**

A number of key collaboration technologies designed to improve productivity and ultimately transform business practices are:

- **Podcasting:** Podcasting offers a way to 'subscribe' to radio programmes and have them delivered to your PC. It is predicted that podcasting subscriptions will grow increasingly important as the market for content continues to fragment, which will lead to a massive shift in radio, and ultimately TV content delivery. Podcasting is an extremely efficient method for delivering audio and spoken-word content to niche audiences and as such could become an important corporate communications tool.

- **Peer to Peer (P2P) voice over IP (VoIP):** Vendor-proprietary P2P VoIP applications are under development although security concerns still need to be addressed. Services like Skype currently enjoy significant consumer adoption and are beginning to make inroads into the business landscape. It is predicted that the technology will be important for collaborative and multimedia applications as well as low-cost communications.

- **Desktop Search:** Also known as personal knowledge search, this is an individual productivity application, residing on the desktop and using local processing power to provide search-and-retrieve functionality for the desktop resident's local e-mail, data store and documents. Google, Microsoft and Yahoo are competing for customer attention, adding to the hype but customers not exhibiting much interest in buying solutions. However desktop search will become a standard feature in Microsoft Longhorn, currently planned for 2006 and should reduce content recreation, increase content reuse whilst raising productivity.

- **Really Simple Syndication (RSS):** RSS is a simple data format that enables web sites to inform subscribers of new content and distribute content more efficiently by bypassing the browser via RSS reader software. RSS is widely used for syndicating weblog content but its corporate use is only starting to be tapped for activities such as corporate messaging. Its simplicity makes it easy to implement and add to established software systems. It is predicted that RSS will be most useful for content that is 'nice to know' rather than 'need to know'.

- **Corporate Blogging:** This involves the use of online personal journals by corporate employees, either individually or in a group, to further company goals. It reached the peak of hype in 2004 although mainstream firms have not yet got involved. Its impact will be on projecting corporate marketing messages primarily and secondarily in competitive intelligence, customer support and recruiting.

- **Wikis:** A simple, text-based collaborative system for managing hyperlinked collections of web pages; it usually enables users to change pages or comments created by other users. Wikis are becoming available from commercial vendors, in addition to many open-sourced products, but not yet from established enterprise vendors. However, they are widely used as collaborative, distributed authoring systems for online communities, especially those using open-source projects. It is predicted that Wikis will impact ad hoc collaboration, group authoring, content management, web site management, innovation, project execution and research and development.

b) **Next Generation Architecture**

Next generation architecture will constitute the third big era in the IT industry's history (the first having been the hardware era and second belonging to software). These emerging technologies will form key pillars of the new architecture:

- **Service Oriented Architecture (SOA):** SOA uses interactive business components designed to be meaningful, usable and useful across application or enterprise boundaries. Despite the current disillusionment with SOA, it is expected support for SOA to grow and for it to mature as a technology within ten years although many changes in user and vendor organisations and technologies are required before SOA reaches its full potential. However, in the longer term, it is believed that SOA has the potential to be transformational to a business.

- **Web Services-Enabled Business Models:** These productivity-boosting models represent a new approach to doing business among enterprises and consumers that would not have been possible without the benefits of web-services. However enterprises are still wrestling with what web services will do and it is expected that the potentially transformational impact of Web Services-Enabled Business Models will have to wait for more-mature standards and clearer examples.

- **Extensible Business Reporting Language (XBRL):** This is an Extensible-Markup-Language-defined standard for analyzing, exchanging and reporting financial information. XBRL helps organisations meet multiple financial reporting needs through a single instance of financial data. It also improves the timeliness and accuracy of financial and regulatory reporting, validation and distribution. XBRL enables integration, aggregation, validation and comparison of financial data. It also automates sourcing and the review of financial data for activities such as loan acceptances, investment portfolio management and risk reviews. Financial accounting software vendors are already incorporating XBRL while regulatory and transparency pressures increase the significance and likelihood of XBRL adoption. However, there have been setbacks in XBRL adoption in the past year; the most significant have been delays in the FDIC and FSA projects that will mandate XBRL reporting.

- **Business Process Platforms (BPP):** BBP provide business process flexibility and adaptability. They use SOA design principles and are metadata and model driven. It is believed that Business Process Platforms will enable business process fusion and move innovation from business application vendors to BPP ecosystems. Ultimately they will replace customized business applications and custom development by extending core applications platforms with composite applications.

c) **Real World Web**

It is believed that adding networking, sensing and processing to real-world objects and places is creating a 'Real-World-Web' of information that will enhance business and personal decision-making:

- **Location-aware applications:** These are mobile enterprise applications that exploit the geographical position of a mobile worker or an asset, mainly through satellite positioning technologies like Global Positioning System (GPS) or through location technologies in the cellular network and mobile devices. Real-world examples include fleet management applications with mapping navigation and routing functionalities, government inspections and integration with geographic information system applications. Mobile workers will use either a PDA or smart phone, connected via Bluetooth to an external GPS receiver, or stand-alone positioning wireless device.

- **Radio Frequency Identification:** Otherwise known as RFID, passive Radio Frequency Identification has been somewhat over hyped in recent years although vehicle-based systems are strong. It involves the tagging of very small chips to arbitrary types of objects. These chips transform the energy of radio signals into electricity then respond by sending back information that is stored on the chip. The most conducive environments for passive RFID are chaotic or unstructured business processes where RFID's ability to read without a direct line of sight gives it the edge over traditional bar-coding methods. These might include such diverse activities as manufacturing, healthcare, logistics, animal tracking and laundry automation.

- **Mesh Networks — Sensor:** Mesh Networks are ad hoc networks formed by dynamic meshes of peer nodes, each of which includes simple networking, computing and sensing capabilities. Potential impact areas include low-cost industrial sensing and networking, low-cost zero management networking, resilient networking, military sensing, product tagging and building automation.

Check Your Progress 2

1) State True or False:

   a) Risk factor is worked out by combination of (a) probability of risk and (b) effect of risk. True ☐ False ☐

   b) In disaster recovery plan, communication, designated operator, designated manager and external resources likely to be needed must be listed and kept updated. True ☐ False ☐

   c) Portfolio management technique is a tool in which only top management is involved. True ☐ False ☐

   d) For automating the portfolio management process, the key tools to be looked for are: Common repository, Direct data collection and interchange and configurable data views and portals. True ☐ False ☐

   e) For implementing a portfolio management system appointment of an application administrator does not help if system administrator is already in place. True ☐ False ☐

2) Answer the Following Questions:

   a) What are the steps involved in IT Risk Management Process?

   ………………………………………………………………………………
   ………………………………………………………………………………
   ………………………………………………………………………………

   b) What are the steps involved in planning for Disaster Management?

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1.10 SUMMARY

In this unit, we have discussed practically all aspects of the portfolio management. We have covered starting from what is portfolio management to its techniques, methods, tools, issues relating to it and its implementation procedure. This is one of the most acceptable procedure for evaluation of software projects these days. It is suggested that this study may be further supplemented by completing case studies on this topic.

Another very important area covered in this unit is risk assessment and preparation for the disaster management as well as recovery from the disaster. With the growing dependence on information systems, preparedness for any eventuality is definitely a wise thing. It is a matter of concern that after the tragedy so many people and authorities talk about it but eventually keep on hanging on it till next tragedy happens. So let us look forward not to this mistake and prepare for it.

Emerging technologies discussed in this unit are basically for motivating all students to cultivate the habit of looking around the Internet and other places to keep abreast to the trend.

1.11 SOLUTIONS / ANSWERS

Check Your Progress 1

1) **True or False**

   (a) False, (b) True, (c) False, (d) True, (e) True.

2) **Answers / solutions**

   (a) The key functional requirements which must be available in the Portfolio Management Solution are:

   Budget and Financial Management:

   i) Business Planning and Portfolio Management,
   ii) Project and Resource Management,
   iii) Collaboration and Knowledge Management.

   (b) The steps for portfolio management implementation are:

   i) Gather all ongoing / planned Projects list with necessary details,
   ii) Evaluate: Identify Projects That Match Strategic Objectives,
   iii) Prioritize and Categorize Projects,
   iv) Review: select the Portfolio and implement it.

Check Your Progress 2

1) **True or False**

   (a) True, (b) True, (c) False (d) True (e) False.

2) **Answers / Solutions.**

   (a) The steps involved in IT Risk Management Process are:
   i) *plan* use of technology,
   ii) *assess* the risk associated with the selected technology,
   iii) decide how to *implement* the selected technology, and
   iv) establish a process to *measure and monitor* risk.

(b) The steps involved in planning for Disaster Management are:
   i) assess risk,
   ii) find options which have lower risk levels / risk reduction,
   iii) identify Common Disaster Plan Elements,
   iv) establish Recovery Procedures.

1.12 FURTHER READINGS/REFERENCES

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UNIT 2 ENTERPRISE RESOURCE PLANNING SYSTEM

Structure **Page Nos.**

2.0 INTRODUCTION

There is a saying that specialist will be ‘one who knows everything about nothing’ or in a layman language we can say that ‘knowing more and more about less and less’. The development of IT has followed the same pattern, at first we had the study of ‘computers’ then further we studied of hardware and software. Software became further specialised into system software and application software. ERP is a living example of new-fangled application software. Achieving and maintaining competitive advantage is the underlying principle for every business around the world. Companies are struggling nowadays, conversely, with the integration of information from diverse contrasting IT systems and are spending approximately 40% of their IT budgets on maintaining such legacy systems. To meet this challenge, companies are investing considerably in enterprise information system which in general known as Enterprise Resource Planning (ERP) applications. It had been sighted that ERP is a key enabler of business process transformation and IT automation. As a substance of fact, gaining strategic advantage is often cited by enterprises as a key reason for implementing ERP. Over recent years the attainment, accomplishment and exercise of Enterprise Resource Planning (ERP) Systems has turn out to be a standard facet of most of the corporate and institutions. At this juncture most of the literature on ERP implementation has focused on the early stages of the ERP lifecycle: adoption, resolution, acquisition and implementation. This unit tells the fairy-tale of ERP systems as a commercial software package that enables the integration of transaction-oriented data and business processes all the way through an enterprise. ERP systems endow with cross-organization integration through embedded business processes and are by and large composed of numerous modules including human resources, sales, production, purchase and finance. During the 1990s ERP systems were the de-facto standard for replacement of legacy systems in large companies **(Parr and Shanks 2000).** This unit will outline three (of the several) enterprise applications and business driver's service providers can use to discriminate themselves. We will examine the concepts & purpose of effective enterprise resource planning (ERP), customer relationship management (CRM), and Supply chain management (SCM). We will also demarcate the major aspects of all, examine the drivers and impacts of each, and reflect on how each relates to the service providers' product sets. If we go into the depth of enterprise resource planning system life cycle or rather ERP System Life cycle, the Figure 1 can furnish an elaborate view as the whole process consists of four steps which starts with *Step-1 Assess:* Provide information about cost, size of the package, when to buy, what to buy, what is right, what is wrong whether to go for in-house ERP or invites ERP vendors. *Step-2 Select:* Once the assessment is done next task is to select the module which is an utmost essential, lets take an example of HLL-A FMCG MNC, in India is a marketing oriented company, is in the process to implement the ERP module then it could be beneficial for the company to select the marketing modules. *Step-3 Implement:* Once the selection process is completed, the implementation starts. It is again a very careful and sensitive stage as implementation is not a one-day job and it takes years to go for final touch. In actuality implementation is a joint effort between internal & external team. At last *Step-4 Support:* the annual maintenance contact, in a layman term. It is significant as two different kinds of mindsets are going to inter-mingle, i.e., vendor side and the customers.

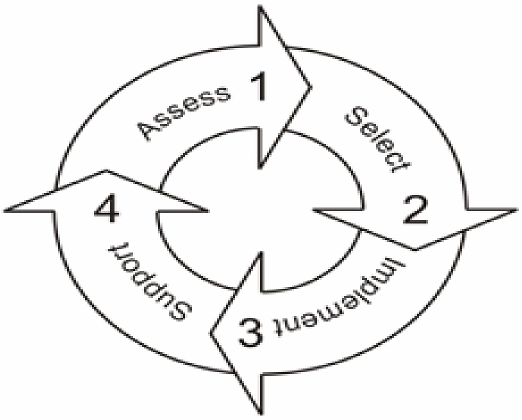


Figure: 1 ERP life cycle

ERP systems can provide the foundation for a wide range of e-commerce–based processes, including web-based ordering and order tracing, inventory management, and built-to-order goods. This unit examines the pros and cons of ERP systems, explains how they work, and highlights their role. We begin by explaining the background of ERP systems and goes on to discuss specific systems, and their capabilities. The unit contains several detailed case studies and will be an invaluable guide to managers and consultants working with ERP systems. It will also be a useful reference for other students taking courses in information systems.

2.1 OBJECTIVES

After reading this unit, you should be able to:

- describe the ERPs evolution and stages through MRP II Roots;
- explain the background of ERP system, and expert systems;
- other ERP Challenges;

- ERP Capabilities;
- explain the efforts made in creation of these systems;
- identify and discuss their advantages in business applications, and
- other ERP Hidden costs.

2.2 ERP-HOW DIFFERENT FROM CONVENTIONAL PACKAGES

Conventional packages are very much confined and restricted. In a general term it is known as legacy system. The features are very less and a slighter possibility to explore. ERP packages are miles away from these petty things. It follows the back-office and front-office concepts. The back-office job is to look after the raw material, financial issues, logistics and in brief internal matters. On the other hand front-office job-profile is to directly interact with customer. CRM is coming up as a front-office package. If we go into the depth of following figure, legacy system are very much condensed and compressed where as ERP system at the same time as compared to it are auto transactional, self helping, and mould itself in different crucial conditions i.e as a generalist and specialist. *Figure 2,* explains the comparison between the legacy and ERP systems.

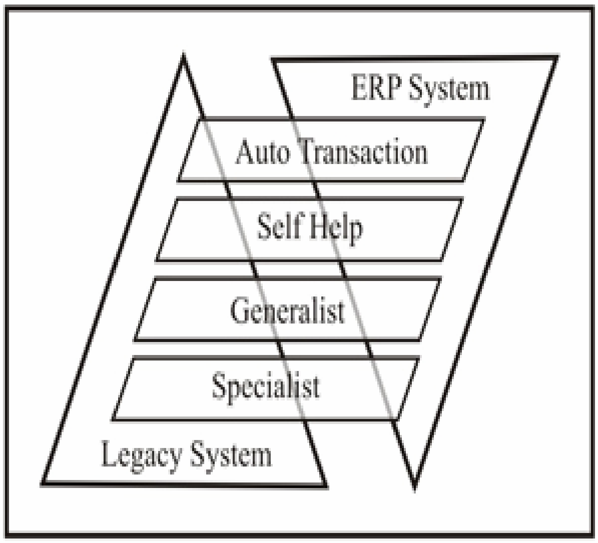
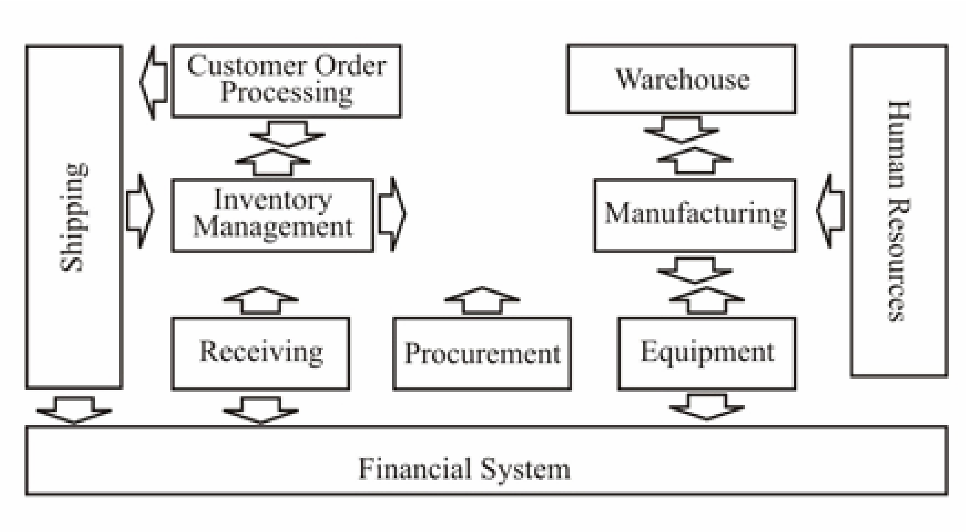


Figure 2: Legacy system and ERP system

2.3 CURTAIN RAISER TO ENTERPRISE RESOURCE PLANNING SYSTEM

ERP is not merely reengineering systems; it is reengineering the manner organisations accomplish business. In a recent CIO Magazine case study, Jeri Dunn, CIO for Nestle USA, said it this way, "If you weren't concerned with how the business ran, you could probably [install the ERP software] in 18 to 24 months" **(Worthen 2002**). ERP is one of three enterprise-class applications, including Customer Relationship Management (CRM) and Supply Chain Management (SCM) that companies are deploying to automate business processes. ERP is focused on internal back office operation to external front-office such as financial system, human resources, inventory management, shipping, customer order processing and warehouse etc. (see *Figure 3*)



2.4 BRIEF HISTORY OF ERP

More or less any dialogue on enterprise resource planning (ERP) starts with material requirements planning (MRP-I) and Manufacturing Resource Planning (MRP-II) systems of the 1970s and 1980s. In the manufacturing environment of yesteryears, the artistic focus was on the competence to produce the product. This system integrates capacity, design engineering and management, costs, and long range planning of the enterprise into the equation. There are four stages to ERP.

- **MRP-I:** Material requirement planning, which was nothing but a historical background of ERP, the motive, was only to tap inventory i.e. raw materials planning.

- **MRP-II:** Manufacturing resource planning which looks after production related things. The concept of MRP II was to look after shop floor and distribution management activities.

- **ERP: E**nterprise resource planning whose role is very wider and not confined to one department but have a broader purview.

- **ERP-II or MRP-III:** Money resource planning or ERP-II advent can be seen few years after ERP system origination which more emphasize on planning of capital or when surplus money arises.

2.5 FORCES, WHICH MAKES ERP STRONG AND SUCCESSFUL

There are distinguishing forces, which make ERP well built and flourishing. These are not confined to following but changed according to the circumstances.

E-commerce: Without Internet and e-commerce ERP is like, a boat without rudder as there are many locations, which cannot be accessible by road so there is a need of wireless systems, which can efficiently be managed through Internet.

Customer: Customer is vital for every vendor either it is fast moving consumer goods, or service oriented organisation like, insurance sector. Because if there could be no customer there would be no circulation consequently no selling, thus without customer ERP is useless.

Enterprise: It is an appropriate place where it can show its potential.

Financial infrastructure: ERP is not like a windows 98 package, if you won't get the original one you can purchase the pirated from computer shop say in Nehru Place. It requires a planned fiscal setup. *Figure 4* can make the picture clearer.

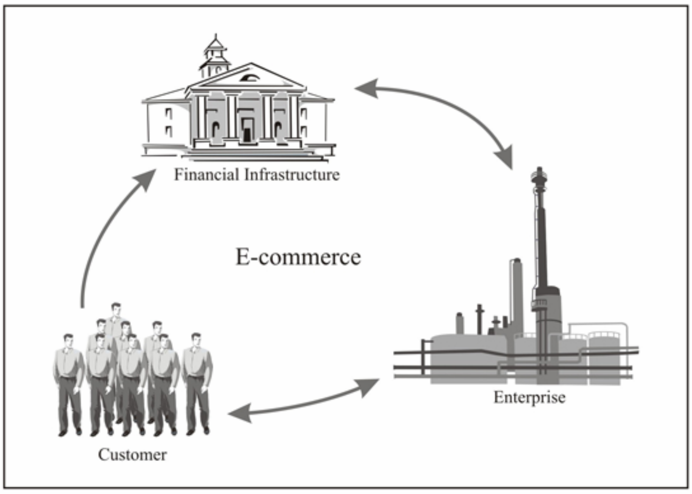


Figure 4: Four Forces, which makes ERP strong and successful

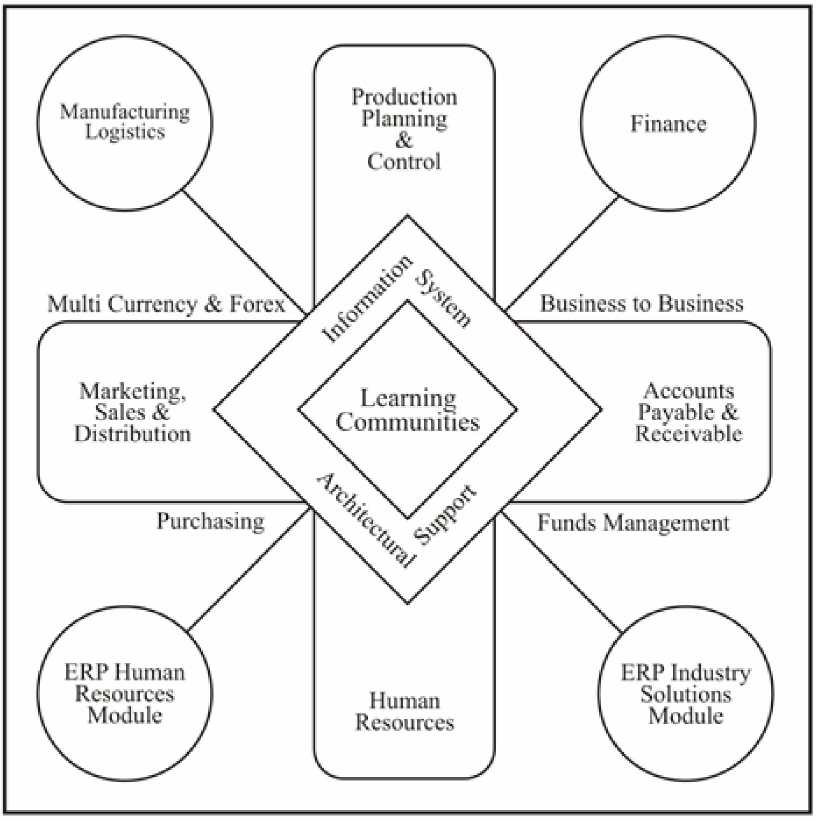
2.6 NEED OF ERP

Conventionally, companies have created islands of automation. A hodge-podge of distinguishes systems that operated or managed a diversity of contradictory business processes. Companies have had analogous complicatedness with each new wave of information technology since the first mainframe systems. It takes years to apprehend some envisioned IT-enabled changes in organisational processes and performance, and there are many ways to fail along the way. An ERP can be defined as a coordination in which various functions of a company (accountancy, marketing, and production) are connected each others by the use of an information system centralized on the basis of a client/server configuration. It is regarding the integrated management system of a company, constructed on an integrated software package undernourished. The need of ERP can be elaborated and explained with the help of following question:

- **Why should we implement an ERP packages.**
  Ans: We should implement an ERP package to get an edge over our business rivals.
- **Will it significantly improve our profitability?**
  Ans: Have you any doubt about its creditability? It will bring drastic change once you put the flavour of it in your organisation.
- **Will it enhance our customer satisfaction level in terms of cost, delivery time, service & quality in totality?**
  Ans: Take an example of pitcher when we go into the market to purchase it and if there could be any hole of very minute size say 0.0005 mm should we purchase it answer is no! So totality is like that, it would not be 99.9 % but absolute 100 %.
- **Will it enable the organisation to reengineer the business process?**
  Ans: Yes by changing the approach i.e. mindset of the people and office automation
- **Will it permit the organisation to achieve the same business volume with reduced manpower?**
  Ans: Yes because ERP is a process by which certain technologies and know-how can be incorporated and put into force, which can reduce and eliminate surplus or unwanted manpower thus results in reduction of cost and increment in profit

2.7 ERP COMPONENTS

If your requirements go ahead of the capabilities of accounting software, and you find the prospect of implementing conventional ERP software overwhelming, you need ERP. All application modules share data through the ERP database, which contains the data for all modules. This is a new implementation of the old key database concept of entering data one time and then using it in all other processing. The world's finest easy-to-use ERP solution is fully web-enabled, seamlessly integrated and can be implemented in weeks. And it can computerize your complete operations globally. ERP can furnish assistance in accomplishing unimaginable efficiency of operations, significant cost savings, and maximize profits. ERP is packed with powerful features, tremendously easy to implement and use, comprehensive in its scope, modular and flexible, fully customizable, totally secure, and incredibly robust. It is the way companies will manage their businesses tomorrow. With ERP, you can assimilate transactions of any pulse of the entire organization, all the time. This drives costs number of your company's branches into one system. ERP can be completely web-enabled and from any type of software on any platform, you can deal with your entire business by exception. ERP modules are a most excellent way to integrate all the departments. It is like a four-wheeler which can not shift single steps without its underneath, for ERP the underneath are its modules which sometimes also known as components. These modules enables all the employees of an enterprise to operate like CEO, giving them the tools, information, and insights they necessitate detecting problems earlier and taking action faster. To facilitate the easy handling of the system the ERP has been divided into the following core subsystems as shown in *Figure 5*.



Source: Adopted from Joseph. G. & Goorge. A 2002

Figure 5: The ERP Learning Community Framework

a) **Finance**: ERP takes care of complete financial accounting of the enterprise over the web. It maintains all the books and records that are essential for proper bookkeeping and accounting. All transactions affect and update the entire system, and the entire reporting is on the fly, for the most accurate information at all times. ERP helps you to manage all kinds of taxes, bank reconciliation and everything else that is required for efficient and complete financial accounting. Thus, financials provide real-time visibility into financial results, minute-by-minute control over expenditure, and guidance for better decisions,

b) **Human Resources**: Handling Software for personnel-related tasks for corporate managers and individual employees of the organisation. Examples: human resources administration, automatic personnel management processes including recruitment, business travel, and vacation allotments, payroll handles accounting and preparation of cheque related to employee salaries, wages, and bonuses. Thus, human resources offers comprehensive HR solutions, from recruitment to compensation to work-force development

c) **Manufacturing and Logistics**: A group of applications for planning production, taking orders, and delivering products to the customer. Examples: production planning performs capacity planning and creates a daily production schedule for a company's manufacturing plants. Materials management controls purchasing of raw materials needed to build products.

d) **Purchasing**: Empower the Purchase function just like sales, indents, and orders. ERP covers all aspects of production, including issues quality control, material receipts, purchase invoices and production receipts, multiple bills of material. Thus, purchasing saves the time by simplifying and improving vendor evaluation, performance tracking and quality examination.

e) **Production, Planning and Control**: ERP enables you to plan for material requirements based on a production planning process. The system reports inventory requirements based on work orders initiated, stocks committed and existing stocks. Thus, PPC provides all possible reports and analysis, which facilitates in managing and keep good control of inventory.

f) **Multi currency and Forex**: ERP supports accounting for multi-currency operations, with exchange rate tables, transactions in any currency, accounting and reporting in all currencies, and accounting for forex gains and losses.

g) **Business 2 Business (B2B)**: ERP is a virtual portal that can be accessed by customers, distributors, suppliers, and auditors. Anyone with a computer and a modem, and the necessary access permissions, they can place orders and monitor deliveries, and view account statements. To improve your service efficiency you can allow your business associates to manage their own interaction with your enterprise. All reporting can be individual, grouped, or instantly consolidated across the enterprise.

h) **Funds Management**: ERP enables you to manage funds efficiently. For each wing maintains your complete customer database and does kind of transaction type you may specify its effect on funds flow.

i) **Marketing, Sales and Distribution**: Helps to optimize all the everyday jobs and activities carried out in sales, delivery and billing. Key elements are: pre-sales support, inquiry processing, quotation processing, sales order processing, delivery processing, and billing and sales information system. This module also includes a Point-of-Sale, which comes under retailing, can optimize the sales figures and also facilitate in having more delighted customers. Billing system with barcode label provides better reading, printing, quick billing and collections.

2.8 DISTINCTIVE WAYS OF IMPLEMENTING AN ERP

A properly implemented ERP system can convey good results & dramatically enhance the aptitude to diminish costs, run leaner, and endow with good customer service. These are distinctive ways of implementing an ERP and following are the implementation approaches:

- **Phased implementation approach:** This implementation approach is also known as Modular Implementation. The system of modular implementation goes after one ERP module at a time. This limits the capacity of implementation usually to one functional department. This approach suits enterprises that do not share many widespread processes across departments or business units. Independent modules of ERP systems are installed in every unit, while integration of ERP modules is taken place at the afterward stage of the project. This has been the most usually used methodology of ERP implementation. Each business unit may have their own 'instances' of ERP and databases. Modular implementation trims down the risk of installation, customisation and operation of ERP systems by reducing the scope of the implementation. The successful implementation of one module can promote the overall success of ERP projects.

- **Big-Bang implementation approach:** This requires simultaneous implementation of numerous modules of an ERP packages. Enterprises outline a grand plan for their ERP implementation. The installation of ERP systems of all modules happens transversely the entire enterprises at once. The big bang approach has the prospective to condense the integration cost if it's executed methodically and cautiously. This method dominated early ERP implementations; it partially contributed to the higher rate of breakdown in ERP implementation. Today, not many companies dare to endeavor it anymore. The hypothesis of this implementation method is treating ERP implementation as the implementation of a big information system, which typically follows SDLC (Systems Development Life Cycle). But ERP is much more than a conventional information system because the implementation of ERP continuously calls for the realignment of business processes. Many parties concerned in ERP software systems are not IT professionals. ERP more than automates existing business processes and alter the business processes.

- **Process-Oriented Implementation:** This method of implementation focus on the support of one or a few critical business processes, which involves a few business units. The initial customization of the ERP system is limited to functionality closely related to the intended business processes. The process-oriented implementation may eventually grow into a full-blown ERP system. This approach is utilized by many small to mid-sized companies whose business processes are not too complex.

- **Vanilla implementation approach:** In another implementation approach that focuses on minimal customisation of the ERP packages.

2.9 GUIDELINES FOR ERP IMPLEMENTATION

1) **Understand your corporate needs and culture:** An ERP implementation will bring a change in the roles of different departments and responsibility. In short, it will result in a change in the existing power structure.

2) **Complete Business process Change:** ERP can change the whole outlook of business by fully reengineering it and giving it new shape and direction, which could be unimaginable.

3) **Provide strong Leadership:** Leaders plays a very vital role in making a destiny of followers, so while selecting a team leader/project leader, this point has to be kept in mind.

4) **Choose a balanced team:** The system environment of today's ERP solutions is complex: RDBMS, servers, networking, LAN, WAN, etc. There will be no longer a lot of documentation to specify the requirements. These will be on-line, as an integral part of the package. So the team should be balanced in order to rectify the error.

5) **Selecting a good implementation methodology:** It is advisable for the project leaders to set out clear and measurable objectives at the very beginning and review the progress at intervals, as the implementation progresses**.**

6) **Train every one:** Since this ERP package is not confined to specific people but a beneficial to whole organisation so as far as training part is concerned it will be given to all and not restricted to few as it is indirectly going to benefit the organization alone.

7) **Commitment to adapt and change:** An ERP implementation should not look upon as a short distance run. It's an on going process. It has wide implications, and will impact the future of the company for many years to come.

2.10 PRACTICALITIES IN AN ERP IMPLEMENTATION

a) **Inner Practicalities:** The key practicalities in an ERP implementation are the internal preparation. Whether or not a project is successful, depends to a noteworthy extend on an adequate amount of internal preparation.

- **Be acquainted with your necessities:** Nobody knows your business better than you accomplish. Before calling in vendors, the groundwork within the enterprise is vital. This will not only get geared up to appraise the vendors and applications more effectively, but will also facilitate the enterprise to get better utilisation of any system.
- **Fundamental Point:** Distinguish all problem areas in the current work process and list transaction that seem to entail special processing from the general process, sales invoices that can not be traced to a sales order, which could pose a trouble in certain types of businesses. Test out the prospect of simplifying procedures and identify areas of duplication of effort. Assemble user complaints of the existing system and categorize them accordingly into sales and purchase. This could be valuable source for evaluating alternative systems. Accumulate information regarding the requirements for reports at various levels of management. If the operations are extend across a region or are global, it has to be considering using one system at all locations, and vendor should have the proficient of supporting the company at all locations. The present hardware infrastructure obtainable has to be checked.

b) **Outer practicalities:** The new economy and the extended enterprise are the key external factors that have motivated and sometimes pushed some companies to implement an ERP system. A psychological effect also plays an important role on the ERP implementation, where a company takes a decision driven by the phenomena and not necessarily by its own needs.

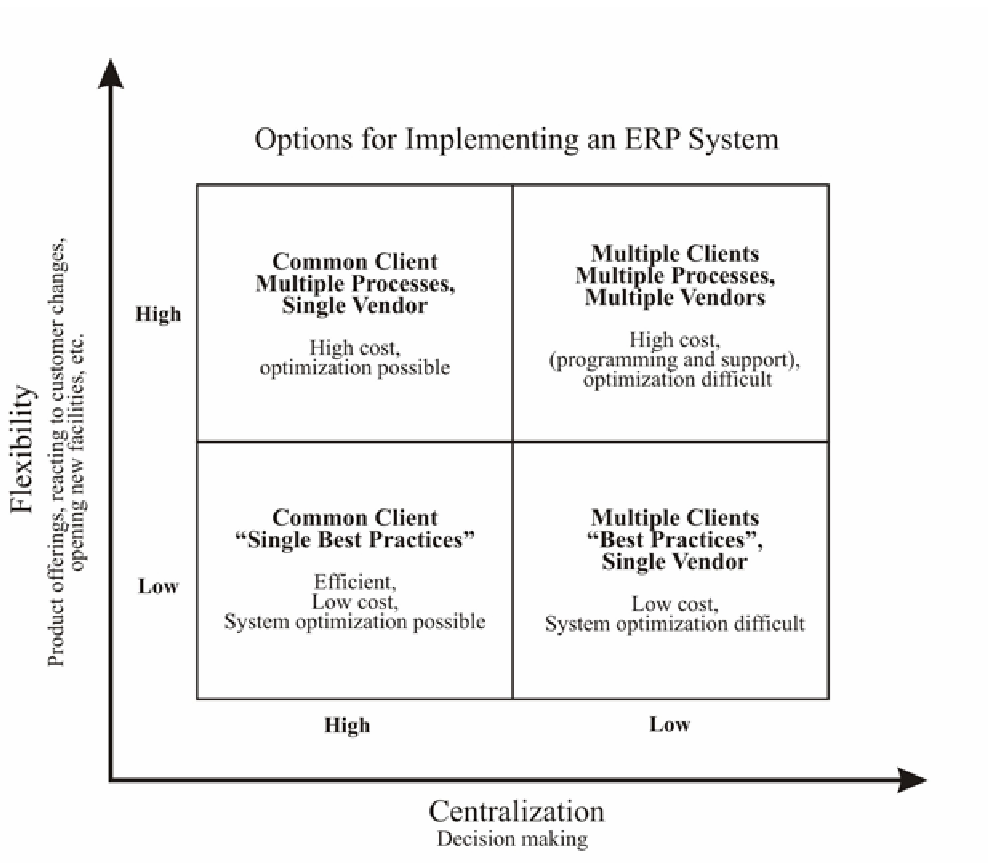
2.11 OPTIONS FOR IMPLEMENTING AN ERP SYSTEM

Flexibility means nothing but customisation. Say there is one institution XYZ Management College that is a pioneer name in the field of academics and now it had expanded into the FMCG business and the ERP package implemented is BaaN IV ERP software. At this juncture, flexibility with respect to this is that, it is the single software, which can deal with both the manufacturing organisation and academic institution.

Centralisation: It could be so much centralised that all the departments are streamlined and decisions will be taken from one place.

X- Axis => Centralisation
Y- Axis => Flexibility

	Case-1	High Centralisation- Low Flexibility
	Case-2	High Centralisation- High Flexibility
	Case-3	Low Centralisation- Low Flexibility
	Case-4	Low Centralisation- High Flexibility



Source: BaaN IV ERP software

Figure 6: Option for implementing an ERP system

2.12 CONQUERING IMPLEMENTATION OF ERP

Enterprise systems are all about the enterprise and not about systems. Its success greatly depends on the responsibility of top management and active participation of the HR people. The popular notion is that implementation of an ERP is a technology decision. In fact, it is a decision that preferably should be based on business needs and benefits. The success of an ERP solution depends on how quick the benefits can be reaped from it. This necessitates rapid implementations, which lead to shortened ROI periods. Traditional approach to implementation has been to carry out a Business Process Re-engineering exercise and define a "TO BE" model before the ERP system implementation. This led to mismatches between the proposed model and the ERP functionality, the consequence of which was customisations, extended implementation time frames, higher costs and loss of user confidence.

- **Implementation strategy and approach:** Organisational readiness and preparedness is what makes the key difference between success and failure. Any ERP implementation brings a transformation in varying quantum; hence, senior managements commitment to change management process and piloting the ERP implementation becomes completely necessary. Over a period of time, the additional functionalities that are available in the ERP can be implemented and by that time, the organization would have tasted success of the implementation. The end-user participation and ownership of implementing the ERP is a notable paradigm shift compared to the conventional software development process. Implementation strategy is context dependent. So what is successful in one company may not yield similar results in another organisation. Therefore, the strategy and approach to implementation is a key enabler for successful implementation.

- **Start up education:** The simplest and most cost effective education method is to set up either a 2-day corporate training in the company or at a convenient local venue.

- **Continuous communication:** The success of the ERP initiative, on the softer side, can be accredited to two things, first, in all the communication about the project, a exercise of tying central messages and specific department objectives and needs back to the overall company. Second, a habitual mix of efforts to include everything from conducting workshops, publishing newsletters and holding focus groups to organising lunch time discussions and traveling road shows each designed to suit dissimilar stages across the implementation life cycle.

- **Forming the team:** Selecting the right project leader is as important as selecting the right package. Core team leadership is a full time assignment. Team leaders should know the business well and have cross-functional experience. They should also be politically savvy, have credibility within the organization and be good communicators, and, of course, be from the business side and not the IT management. The team is also as important as its leader. The apex management must make sure that the best and the brightest join the team.

- **Project planning:** An important task is the preparation of detailed plan that covers the total implementation process. Here various project management techniques like PERT charts can be used. The implementation plan should have clear components and should include the time schedule, ownership and responsibility, resource requirements and critical success factors for each phase. The milestones are as follows and thus may be included in project plan that is Training of project team members, Mapping of business onto the software, Function-wise implementation, Customization, Uploading of data, Tests run, Parallel run, Crossover, etc. IT projects are essentially systems integration projects. They are complicated and require attention on issues such as the implication of even the slightest change. The project planning should also lay emphasis for determining the effort (in man-months man-hours) required for carrying out the various activities. It is important to: (a) scope the project, (b) estimate the step-wise and task-wise man-hours required, and (c) preparing a schedule. These all will lead to project plan preferably using project management tools like network charts, project management software, PERT/CPM.

2.13 DYNAMICS THAT SHAPE THE PRICE TAG OF ERP

You don't have to be a specialist to be acquainted with that, ERP is one of the most precious technology initiatives that an enterprise can implement. While it is very intricate to endow with global costing guidelines, there are some vital considerations that can smooth the progress of you to guesstimate your total expense for implementing ERP. Here is an overview of four cost dynamics associated with staffing during an ERP implementation. These dynamics will likely weigh into your decision about whether you should purchase a packaged ERP system from a vendor or if you should custom fabricate an ERP solution in-house.

- **Dynamics A- Plan for human costs:** The costs of installation, implementation, and data migration generally run about three to four times the original cost of the packaged ERP software. For example, if your software costs $2 million, you can expect to pay an additional $6 million to $8 million for consulting services to get the system into production, which sometimes considered as hidden costs.

- **Dynamics B- Consider remote consulting:** If your organisation is located in a major metropolitan area, you will likely have lower consulting costs. For example, an ERP project in Jamnagar, Gujarat may cost double the rate of the same system developed in Los Angeles. This factor is here because the rates are more steady and competitive in larger cities. Organisations located in smaller cities may have to compensate their vendor for consulting services at a rate much higher than the market average. If your company is located in a smaller city or rural area, you may want to use off-site consulting and hire consultants who work from home.

- **Dynamics C- Transition your IT staff:** In a recent survey it had been determined that end-user adoption of an ERP package was the greatest anxiety among IT professionals. Analysts authenticate that training end users is a noteworthy expense. In a recent report on SAP end-user training, Gartner suggests that, at a minimum, enterprises should allocate 17 percent of the total cost of an ERP project to training. Gartner research also establish that companies that budget less than 13 percent of their costs for training are three times more likely to see their ERP projects run over time and over budget when compared with companies that spend 17 percent or more on training. But end users aren't the only staff members who should concern you. Staff turnover among developers is common in organisations that are implementing an ERP solution. If you desire to purchase a packaged ERP solution, be prepared for staff turnover. In many cases, programmers will be excited to learn a new technology, while others are reluctant to clinch change. On the average, IT managers can anticipate to lose up to 40 percent of their IT staff, primarily those programmers who are unwilling or powerless to master the new software.

- **Dynamics D: Avoid the illusions of false savings:** Many managers choose to purchase a prewritten ERP solution under the hypothesis that because the software is prewritten, they can rationalise their IT staff. In reality, prewritten packages require IT personnel to locate bugs and apply patches to the packaged software. There are seldom any real human savings associated with adopting a prewritten ERP package. In practice, your IT staff will stay behind about the same size, with your old programmers being replaced with application specialists.

2.14 ERP BENEFITS

The ERP system has an enormous payback and it is 100 times better than a conventional packages. Some advantageous features of ERP system are: Communication with Suppliers/Customers can be automated, efficiency is aided by reduced manual entries, dependency on human resource eliminated, integration of all function already established, readymade solutions for nearly all the problems, supplier and customer can intermingle on-line at any time, reach multiple locations through one system, complete integration of systems across all functions, pace in transmission of information etc. The few other elaborated benefits are:

- **Automatic Updation to new Technology:** ERP systems can automatically update itself according to the new technology.

- **Enhanced flexibility:** ERP is multi-module application software and is very flexible and frequent, e.g., production manager can access ample number of information through his lap-top of marketing department by sitting at his home.

- **Improved customer satisfaction:** with the help of ERP, customer have an individual login name and password and they are able to solve their grievances by Internet alone specifically no need to waste time in visiting personally.

- **Information Technology:** Reduced support costs. Reduced infrastructure costs.

- **Lead-time minimization:** "time gap between ordering the goods and its delivery is known as lead time" so if this could be minimized then there will be reduction in inventory cost burden.

- **Process Improvements:** Eliminate redundant transactions and multiple reconciliations; extra efficient job rotation process; more efficient staff and succession planning.

- **Related initiatives:** Better focus, reduced spending.

- **Strategic Direction:** Improved resource allocation, More flexible organisation, and better future decision making.

Check Your Progress 1

1) "Enterprise systems are all concern with the enterprise and not about systems. Their success to a great extent depends on the responsibility of top management and energetic participation of the HR people. Implementation of an ERP is not a technology decision. In actual fact, it is decision that ideally should be based on business needs and benefits". Explain and elaborate the above statements in the lights of ERP systems?

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2) What are the strategies used for successful implementation of ERP application?

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3) What are the objectives of implementation of ERP? Explain distinctive ways of implementing an ERP. In short throw some light on the guidelines for ERP implementation and practicalities face during implementation?

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4) How ERP systems have changed the work of IT organisation?

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5) What do you mean by resource and how it had a relation with ERP?

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6) From where ERP had been originated and what are the concepts behind it beginning?

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7) What are three major reasons to undertake ERP?

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8) What do you mean by components of ERP?

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2.15 CUSTOMERS EXPECTATION IN ERP PACKAGES

Expectations in ERP packages are a birth right for customer as they are a going to be the owner of the product. The customers have to be very cautious and imagine a lot while finally locking the product. The expectations they use to have regarding the product is elaborated and explained one-by-one.

- **Financial health of the company:** Implementation of ERP can give an organisation a new shape that is more emphasize on the financial status, so the organisation awakes about that whether they are moving towards southward direction or in a northward direction.

- **How big the company is and whether its main focus is implementation alone?** ERP's user's total strength and size plays a very vital role while considering all the factors as vendor's core benefit is not only to emphasise on implementation and go out, but to build long-term relationship in order to tap more business i.e., after sales service, more implementation at different places.

- **How easy/fast is it to get skills on the package?** Again this is a question, which varies from company to company and also depends on the level of highly skilled and technocrats employed by the organisation thus whole effort is required by user itself.

- **Is implementation of the package easy:** This is something, which can not be answer in one word i.e., yes /no it is amazing which requires cooperation from user as well as vendor? So it will be an easy job if you are serious and toughest when you take it lightly.

- **Is the package compiled:** It covers all areas of the department starts from production then marketing, purchase, research and development and many more, specifically it has to be very exhaustive.

- **Is the package localised:** Now, the million dollar question is about the SAPAG which is a German based company and has a corporate office at that place alone and if somebody keen to purchase a package who resides in India what strategy the SAP is going to follow as far as service part and other up gradation issues are concerned.

- **Is the package too old or too new:** This includes many other things and gives answers to a lot of questions like latest trends, present platform, also its competency like Y2K compliant? VAT ready etc.

- **Number of implementations in the country:** More the implementation more the experienced ERP vendor are, consequently leads to better after sales service and grasp market share. Take an example of Tally or other financial package such as wings, Accpac, etc. when we actually go for purchasing why we give priority to tally answer is only due to its market share and ample number of implementation.

- **Quality of the consultants hired:** Consultant whose role basically is to bridge the gap between the vendor and the user as a liaison, however same time consultant job is also to provide training, giving knowledge to both user and vendor about the latest trend and also guide them about the in-house development of ERP or purchasing from outside.

- **Who is supporting the package:** Under whom banner the package had been explored, are they the brand name or a layman in the field of ERP. If they are new player what USP's they have followed so the user can be extracted like Oracle- master in production module, but the new player come-up with R &D module which no other vendor have.

2.16 STUMBLING BLOCKS

ERP System, though a boon to the corporate world is again not foolproof. However, this system suffers a number of problems including:

- **Confusing and difficult:** ERP Softwares are a gigantic package and consists of numerous modules, so it is very difficult to understand its characteristics but once you understand it becomes easier to work.
- **Customisation is costly:** Customisation is obviously costly, for instance when report is needed to configure, one person expected from the ERP vendor's side has to come and give support. Hence more the customization /configuration greater should be the service cost charged by the vendor.
- **Customisation is time consuming and in many cases impractical:** ERP is not a one or two day job it is a regular process it requires years to complete as many things have to be incorporated into it i.e. mindset, office automation, etc. There is clause of hidden cost, which always pinches the user.
- **Decline of an individual's monopoly over information monopoly:** As information can be put into the server and rights and authority can be given to appropriate people who can access it so that production department data cannot be confined to production department people. It can be shared by marketing department people with the help of login name and password thus cutting short time and reducing paper work.
- **ERP engenders a host of fears:** It engenders a host of fears on some of them are Job Redundancy. There is misconception among the employees that ERP can be a threat as for upcoming employment, this is not absolutely true because the persons who are not working hard have to be more cautious as performance appraisal chart is regularly maintained and monitored. Therefore, for people who take no pain there is no gain.
- **Geographic Restriction:** The ERP packages are readymade packages made by the ERP vendors and can be customized according to the user need, thus sometimes not suits individual persons who are geographically away.
- **Implementation of an ERP project is a long process:** Like customisation implementation is also a long process because there is ample number of departments and ERP can come in full-flow when the entire department should be fully compatible with ERP integration.
- **Platform restriction:** Platform restricts could be the another obstacles upto some extent as they are using different operating systems.

Major stumbling blocks take account of the technical issues around providing adequate and protected access to ERP from heterogeneous locations and platforms.

2.17 ERP SYSTEM ACCOMPLISHMENT

Though ERP systems suffer from certain drawbacks or rather we can say certain obstacles but its merits supercode it demerits. Few accomplishments, which motivate ERP to follow the 24x7 culture. While ERP systems are generally the most expensive institutional information system implemented by most institutions over recent years, they are not alone. At most Universities there are other information systems filling organizational needs that ERP systems do not address. Course management systems (CMS), such as WebCT and Blackboard, are usually the next most expensive and far-reaching example. Other institutional information systems may include: timetable management software, assignment tracking software, bookshop management software, library catalogue systems and various infrastructure systems such as student and staff authentication. While the label of this paper mentions ERP systems, the basic premise of this paper is that a gap exists between the functionality of all institutional information systems and the needs of the staff and students. The few USP's of ERP systems are:

1) **Web-based student records:** Provides staff with access to student records data including course lists, student photos, and student enrolment details.
2) **Timetable generator:** A web application that allows a student or staff member to generate a personal timetable.
3) **Minimum course presence:** The provision of a consistent minimal web site for every course offered by Infocom independently of academic staff and as early as possible.
4) **Informal review of grades (IROG):** Web-based processing of student requests for an informal review of a final grade.

2.18 STEPS FOR AVOIDING PITFALL

An ERP system will perhaps be one of the prime investments you will make, so it's critical to the enterprises to do it accurately. The worst thing you can do is most often by picking the wrong software, make a team to undo the mess, and then relocate for a correct "aim". We have all read the horror stories of enterprises that acquire implementation decision in haste by initially purchasing software before they were ready.

- **Classify the Methodology**: Choose on and stick to a lucid, analytical methodology. The methodology should guide you through each step in the selection process and diminish the emotional proportion in the selection. The processes include distinctive phases for completing a thorough business-process review; evaluating vendors; managing software demonstrations; supporting the eventual decision-making process; and structure the supporting implementation plan, together with costs.

- **Plot to Business Processes:** Don't start with software demos. Begin with your business processes, and then map out your feature/function requirements through a series of business-area reviews, the creation of process maps, an assessment of "to be" process changes, and the development of a requirements matrix with supporting business scenarios.

- **Be conscious of Organisational Chemistry:** Use your instincts when it comes to the organizational chemistry between your enterprises your consultants, and your selected vendor. You want a consulting organization that you sense relaxed with, one that can extract the input it needs from your in-house team members. Be on the watch out for a solution that sounds too trouble-free or will be done in a month. You are making a critical decision this has to be taken into consideration always.

- **Elect to choose a well-built Team:** Set up a steering committee with the president or CEO and heads of sales, finance, and operations, and sanction them to make decisions.

- **Scrutinize Potential Vendors:** Accomplish a rigorous software-selection process, and situate potential vendors under the microscope. Think about more than just features and functionality a financial stability, technology strategies, long-term support, implementation successes, and corporate culture, are key factors.

- **Appraise Business Processes:** Be equipped to alter some business processes if you want to minimize or eradicate customization. Even the smallest enterprises have to make process compromises in their final solution.

- **Bargain Customisations:** Negotiate all of your customisations before signing a contract. If you do have to customize, you want to be acquainted with up front what it will cost and more important discuss about hidden cost and then incorporate that as part of your contract.

- **Modernize Infrastructure:** Plan for an infrastructure improves to sustain the new system. Some ERP implementations require the redesign of your network; make sure you identify what you require to do and how much it will cost.

- **Predict Elaborately:** Elaborately look after your implementation plan. The goal is to foresee now, to eliminate implementation setbacks in terms of both cost and time. Implementation will always be preferred or rather become mandatory with the Vendor team i.e., make convinced that your software vendor has a role in your implementation. The software vendor has the most vested interests in making clear-cut that you are a pleased customer.

2.19 SUGGESTIONS TO AN ERP VENDOR

Deciding by the vendor to supply ERP software is probably the most complex decisions in the whole ERP Project, so you have to incorporate the following point in mind as ERP Software being so expensive, one cannot manage to pay for to make mistakes and correct it later. They have to be very particular in taking decisions, that is, who are the key man and whose benefits are addressed. No doubt that ERP-software is a foremost requisite for a big corporate explicitly who are going to implement it in a near future. The suggestion to ERP-vendor is that they could bestow much emphasis to make their product qualitative, competitive and price effectual rather than contemplate in selling because automatically the sale would come to them once the product is acceptable. Key suggestions that have to capture into account are:

- **Try to sell products in module wise and according to need:** Specifically, if the concern is marketing oriented then force to sell the marketing module of ERP first, if production oriented then the Inventory Module.
- **MoU (Memorandum of Understanding):** Some MoU or issue base alliance is required between the two or more organizations, in order that in short span of time they can be able to fabricate quality product and attract customer. Like sharing of R&D (Research & Development) lab and many others overlap work so to make the product more competitive and cheaper as well.
- **Try to cut-off the existing price** With the intention that vendor inclination is on selling multiple numbers of copies and attain a market share i.e., they will try to sell more licenses.
- **Installed that portion of module which required utmost:** Generally full fledge installation requires years to complete so it is advisable both to vendor and user to installed that portion of module which required utmost. Like, HLL is a FMCG their core area is marketing and selling so they walk off for sales and marketing module first.
- **Proper implementation of an ERP project:** Proper implementation of an ERP project is the most crucial activity in the life cycle of an enterprise. This requires careful planning and teamwork.

2.20 FAQ- FREQUENTLY ASKED QUESTIONS

FAQ-1: Explain what problem the company will face if they develop ERP package in-house.

Soln: ERP packages are software-integrated packages with ERP concepts. ERP vendors generally develop ERP packages. Developing ERP package in-house will let a company to face major problems of cost and time. Developing in-house ERP packages is very complex, time-consuming and extremely expensive. Developing packages is the headache of the ERP vendors. They are specialised at such works and they have made developing packages their own business. Any organisation should concentrate on its own products and its better quality rather than wasting time and money on developing ERP packages. Developing ERP packages should then be left at the disposal of the ERP vendors. Thus, in house ERP packages require much resources and time and moreover its failure may leave the company out of business. So taking such a big risk must always be avoided because it may create a major problem in the business environment of the company.

FAQ-2: What Makes ERP different?

Soln: Traditional computer information systems used by many businesses today have been developed to accomplish some specific tasks and provide reports and analysis of events that have already taken place. Example is an accounting general ledger system. Occasionally, some systems operate in a 'real-time' mode that is, have up to date information in them and can be used to actually control events. A typical company has many separate systems to manage different processes like production, sales and accounting. Each of these systems has its own databases and seldom passes information to other systems in a timely manner. ERP takes a different approach. All applications access common data. Real events in the business initiate transactions. Accounting is done automatically by events in sales and production. Sales can see when products can be delivered. Production schedules are driven by sales. The whole system is designed to be real-time and not historical. ERP structure embodies what are considered the "best business practices". A company implementing ERP adapts it operations to it to achieve its efficiencies and power. The process of adapting procedures to the ERP model involves "Business Process Re-engineering" which is a logical analysis of the events and relationships that exist in an enterprise's operations.

FAQ-3: What types of people become ERP certified?

Soln: A wide range of people chooses to follow the ERP certification for a variety of different reasons. In short, almost anybody who works in or around the ERP industry may choose to become ERP certified. Some common types of people that choose to become ERP certified include:

- Authors and Journalists
- CEOs
- College Teachers
- Consultants
- End Users
- ERP Sales Personnel
- ERP Team Members
- ERP Trainers
- Functional Managers
- Implementers
- Programmers
- Project Managers
- Senior Executives
- Students
- Help Desk Support

2.21 CUSTOMER RELATIONSHIP MANAGEMENT

Preserving existing customers and providing improved services to expand the loyalty is termed as CRM. The rationale that business exists is their customers. Developing rapport with customer and supervising it resourcefully with the intention that it is valuable to both the customer and the business is an imperative goal. CRM facilitates business in accomplishing this goal. In today's marketplace winning and sustaining muscularly built customer relationships can make the difference between success and a failure. Faced with global competition and short product lifecycles, organisations require making accessible their customers with the topmost possible standard of service to keep hold of business. This means knowing the customer's needs, preferences, buying history and potential future purchases. CRM is software, which facilitates an organisation to oversee its customers healthier. Company might have a database about its customers that make available information about them in great multiplicity. With the assistance of CRM software, sales people and service representatives can access this information and bestow with customers with customised service as per customer needs with sky-scraping attitude to product plans and offerings, jog the customers about service requirements, identify what other products a customer had purchased, and so forth. CRM can also be web enabled thus adding greater value to the entire progression. CRM (Customer Relationship Management) applications smooth the progress of the capture, consolidation, analysis, and enterprise-wide dissemination of data from existing and potential customers. To build up the full benefit of CRM, it must be seen as combination of people, process and systems rather than just IT application. Customer relationship management (CRM) is the most talked about of the three enterprise applications that are the focus of this unit. As the economy remains lethargic and customers remain cautious, the need and aspiration to get closer to customers are the primary means of differentiation in the marketplace.

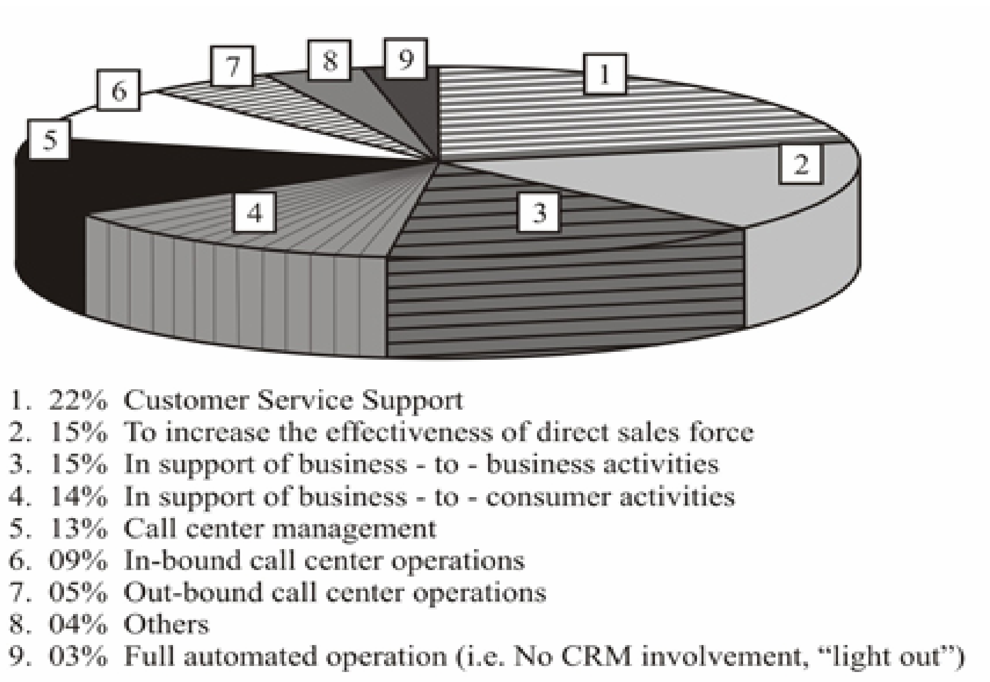

Figure 7: Objectives for using CRM applications

CRM Classification

CRM application software can be normally alienated into five areas,

- **Customer Decision Support:** Customer decision support tools lend a hand to companies in decision-making. Elegant analytical tools are available, that can process hefty amount of data.
- **Customer Information Management:** Customer information management tools facilitate a single outlook of a customer across multiple channels. Customer information management tools make it achievable for customers, staff and intermediaries like contact center to share the same data about a customer across manifold channels.

- **Customer Interactive Management:** Customer interaction management tools, frequently called operational CRM. These tools facilitate additional effective interaction with the customer.
- **Systems Integration:** Systems integration tools permit companies to join mutually in their dissimilar business applications with CRM.
- **Workflow Management:** Workflow management tools augment the customer service by enabling automatic distribution and prioritization of tasks.

What does CRM Provide?

a) **Technology enabled selling:** Technology enabled selling helps companies understand how technology can assist sales and improve bottom line. TES integrates customer information and transaction data. Implementing TES requires high level of integration with legacy systems and disparate hardware systems. TES has three sets of component building blocks.

   a) The first building block customer information. This information is situated in company databases and manipulated either by legacy or ERP systems.
   b) Companies should have infrastructure of systems like telephones, faxes, personal computers and other devices, in place that would allocate company to communicate and demeanor business with customers.
   c) Finally the third is a set of advanced applications, often specific to industries.

b) **Call centers:** Call centers are playing an increasingly significant responsibility. They are emerging as main point of contact, providing service to customers, business partners and employees. Call centers execute the following five functions:

   a) Engender reports for root cause analysis.
   b) Formulate recommendations to customers concerned with the product/service which suits the customer needs.
   c) Make available more information about product and services.
   d) Obtain calls and monitor progress on customer requests and problems.
   e) Resolve issues or refer problems to subsequently level of service.

   Call centers have the ability to be linked with voice, video and data together. Illustration of Polaroid is exceptionally interesting. Polaroid has an after sales service call center in Scotland. Customers across Europe can call into that call center. The computer identifies the country of incoming call and routes the call to representative who speaks that language.

c) **Internet telephony protocol:** This allows customers to speak to the customer representative at the call center while browsing the company's web site. The customer can contact the call center simply by clicking a hyper link. At the other end the call center agent can pull information about customer's history, products, previous service calls if any.

d) **Better Field service:** Companies can make available better field service using call centers. Call centers can forward customer complaints to representatives in the field. Enabled field service sales representative can get up-to-date customer and product information via Internet. Sales representative can get information about product designs and repair manuals. They can ensure outstanding customer queries, service calls, and customer history all while in field. Customers can not only download product documentation but also communicate with other users. It has as database that can provide answers to questions.

e) **One to one marketing:** One-to-one marketing means that business knows' each customers tastes and preferences allowing companies to customize customer visit.

By providing a personalized experience to customer you can accomplish better customer service, retain customers and develop lasting relationships. Amazon is one such example. Amazon knows its customers reading tastes and suggests books that meet up that interest. CRM software facilitates companies to accumulate, retain, and analyse information about individual customers allowing organisations to accomplish this. Call centers and internet make it easy for companies to correspond with customers. It makes easier for them to track buying behavior and keep hold of customers.

Comparative study between ERP and CRM

Since ERP and CRM both talks about integration and both are enterprise oriented, still there are some discrepancies. The comparative study can make the picture clearer by Comparing ERP with CPM.

ERP: Enterprises conventionally focus on processes and technologies, with purpose of optimizing these processes using MRP and ERP systems. The focus was always inward.

CRM: With Enterprises becoming more customers oriented, they are realizing the benefits of including customers and business partners in the value chain. Enterprises are becoming more externally focused.

ERP: Enterprises use ERP systems to integrate and deal with distinguish operations and process. ERP system integrates functions like Accounting, Human Resources, and Inventory Control to give an integrated enterprise.

CRM: CRM Enterprises have started to realize the 'value of strategic extensions' like Supply chain management and Customer Relationship Management applications. These softwares enable companies to amalgamate.

ERP: Enterprises are replacing materials requirement planning with supply chain planning software as it enables companies to generate optimal plans for producing, delivering goods through collaboration.

CRM: Companies are integrating CRM software and other Internet based applications with ERP packages to create what is being termed as 'Extended enterprise'.

ERP: ERP systems handle core information related to company's business, customers, products, orders and employees and financial data. Extended enterprise allows the company to share this single source of information with all relevant parties. ERP can reach out suppliers and customer by means of Internet.

CRM: Applications like CRM and supply chain planning provide enhanced functionality.

Incorporated ERP & CRM Simultaneously in an Organisation

The major purpose behind jointly going for CRM and ERP is that, customer interacts with companies through variety of channels like phone, fax, mail, email, web sites, and wireless devices. Ensuring quality customer service and providing consistent information is main challenge for business. CRM packages can facilitate companies to consolidate information across dissimilar channel and present consistent information, irrespective of channel. The permutation and combination of ERP and MRP has helped organizations congregate data over years. Data collection isn't enough. It must be properly applied. CRM, Internet and technologies have created endless opportunities for tracking, leveraging this data tied up in ERP systems.

CRM Integration Points: Companies are suitably customer oriented. Providing excellent customer service and timely response is no longer a matter of preference but a necessity for business. The winning businesses will be those who can delight customers and work together with business partners. CRM solutions assist companies to accomplish these objectives by leveraging the power of Internet, networking and ERP system and building a effortlessly integrated enterprise. The following Figure 8 can give a clear picture. Companies look forward to extend their capabilities by the two approaches:

- **Best-of-Breed Approach:** They can use best-of-breed approach tying CRM, SCM software provided by different vendors to their core ERP systems.

- **Single vendor Approach:** Else, companies can take a single vendor approach, implementing required systems provided by existing ERP vendor.

Figure 8: CRM is more than software

2.22 SUPPLY CHAIN MANAGEMENT

Supply chain management (SCM) helps businesses to enhance and understand the activities that endow with component level material for their finished product. For example, in the retail sector, wholesaler relationships are vital, and in the automotive industry, part supplier relationships can influence the manufacturer's capability to construct a car on time. By focusing on SCM, corporations can significantly get better operational efficiency. SCM seeks to help businesses control costs by uncovering the difficulties in their key relationships (e.g., with internal suppliers and external vendors). The fundamental matter is the necessity to understand customer demand and bring into line it with the supply side of the business. By doing this, organizations can condense or even prevent costly overruns and/or product shortages.

SCM software achieves these outcomes in a diversity of ways and a variety of implementations. Fundamentally, SCM links suppliers to databases that show forecasts, current inventory, shipping, or logistics timeframes within the customer organization. By giving those suppliers such access, they can well again meet their customers' demands. For example, the supplier can adjust shipping to make certain that their customers have the inventory necessary to meet their customers' needs. Suppliers can download forecasts into their own manufacturing systems to automate their internal processes as well.

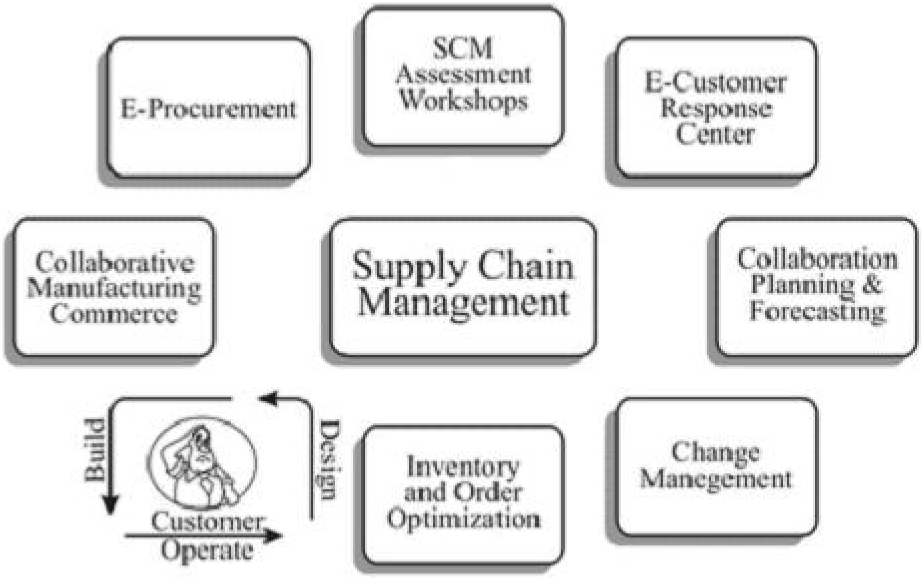

Figure 9: Supply chain management

Collaborative research on ERP integration with SCM

Implementing new software into your company's core businesses processes is a painful modus operandi. In the early 90's, ERP came of age. One and all had to have the functionality ERP packages promised. Since then, as Web and Internet technologies have matured, ERP packages on the front end, and Supply Chain Management packages on the back end, these packages have come into their own. One of the most enduring instructions of the mount and collapse of the dotcoms was their breakdown to recognize the magnitude of sound Enterprise Resource Planning & Supply Chain Management. The capability to deliver on time is perhaps the only differentiator between companies in an arena where the competitor is only a mouse click away. ERP is one such vicinity, which has revolutionized business environment from underneath to pinnacle. Information shows that fortune 1000 firms have or will install ERP system, which will boost the global ERP market from 675 billion to 2250 billion rupees, over the next 5 years. So far, ERP sounds like a great idea. Yet, switching to an ERP system is a bit like constructing a new-fangled residence to replace an aged cottage. You know you necessitate it, and you can envisage how much more functionality the new residence will have, but the aged cottage is paid for and hard to give up. In addition there's bound to be interference during the constructing process and of course some surprises along the way. Victory in today's manufacturing environment is no longer measured merely on the basis of how proficiently your plants can manufacture products. Rather, success is increasingly measured by how effectively and efficiently you can consistently congregate customer requirements. Meeting those ever-changing requirements demands the greatest enterprise solutions for your business – solutions built for manufacturers, by experts who understand manufacturers. ERP with SCM recommends a established enterprise software solution, optimized on and provided specifically the proper platform. The solution offers deep functionality for manufacturing execution and the other areas of a manufacturing.

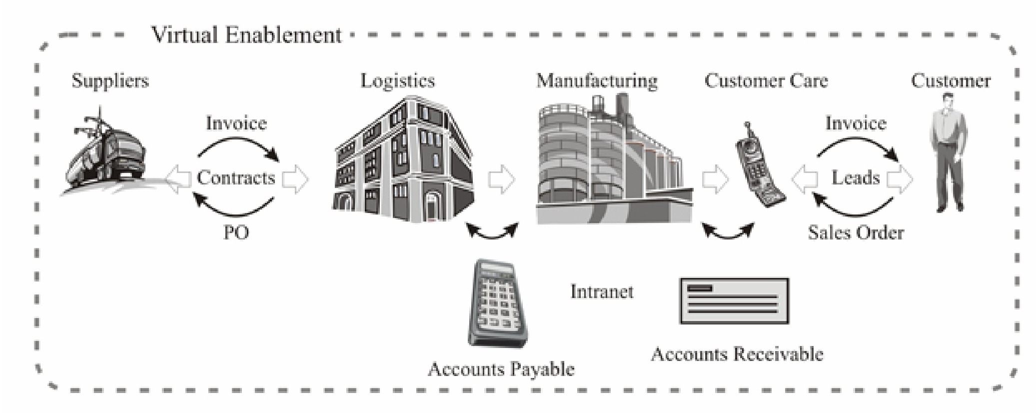

Figure 10: Pictorial presentation of ERP and SCM functioning

Importance of ERP in SCM

Traditionally ERP tools were not considered for SCM and resultantly, the information flow between various members of the supply chain was slow. This was because until the late 1990's the concentration of organizations was on improving the internal efficiency alone. Therefore, ERP systems also supported only such functionalities and the systems across the supply chain were disparate. The organizations however, soon realized that although internal efficiency is important, its benefit would be limited unless complemented by increased efficiency across the supply chain. They also realized that, faultless flow of real-time information across the supply chain was key to success in the emerging market scenario which was characterized by galloping advancements of technology, shorter product life cycle's etc. Therefore, organizations started integrating ERP applications with SCM software. This ensures that the efficiency was achieved across the supply chain and there is a seamless flow of information. ERP in such state of affairs, becomes a vital link in the integrated supply chain as it serves as the integrated planning and control system.
In summary, ERP applications help in effectual SCM in the following ways:

- **Share data:** They can create opportunities to share data across supply chain members, which can help managers in making better decisions. They also make available wider scope to mangers of supply chain by making available much broader information.

- **Real-time information:** ERP systems can provide real-time information, which can be great help in supply chain decisions. For example, ordering raw materials can be based on the inventory details provided by the ERP systems.

Web-enabled ERP and its impact on SCM

The web-based technologies have revolutionized the way business is carried on and supply chain management and ERP are no exceptions. In order to leverage the benefits offered by this new technology enabler, ERP systems are being "web-enabled." Internet allows linking of the websites to back-end systems like ERP and providing connections to host of external parties. The benefits of such a system are that customers have direct access to the suppliers ERP system and the vendors in turn can provide real-time information about inventory, pricing, order and shipping status. Internet thus provides an interface between ERP system and the supply chain members allowing real-time flow of reliable and consistent information. To illustrate a benefit of web-enabling ERP, such a facility allows customers to go on-line and configure their own products and get price information and immediately gets to know whether the configured product is in stock or not. This is made possible, as the customer's request directly accesses the ERP system of the supplier.

ERP vs SCM

The difference between ERP systems (e.g. SAP, Baan, People soft) and SCM systems has been subject to extreme debate. One of reasons for the same is that the ERP vendors are adding additional SCM functionality to their products while SCM vendors are also expanding their functionality, encroaching on the area handled by the ERP vendors. With the vendors of ERP systems and SCM systems adding new and more functionality, the divergences between the same have been distorted. For example, major ERP vendors are introducing advanced planning and optimization as an integrated component (also a component in SCM) of their system. In the following table, let us try to understand the main discrepancy between ERP and SCM systems at the moment available.

Table 2.1: ERP vs. SCM

Point of Comparison	ERP	SCM
1. Comprehensive	More elaborative	Moderately less
2. Sourcing tables	Somewhat still	Self-motivated
3. Complexity	High	Reasonably less
4. Functionality	Moderately less dynamic	Execute simulation of alteration
5. Processing Speed	Quite slower	Quicker
6.. Managing of Constraints	Considered in isolation to each other	Synchronized handling

Check Your Progress 2

1) Can CRM be ERP?

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2) How does Supply Chain Management evolves? Explain in brief the concepts of SCM?

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3) Distinguish between ERP and SCM.

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4) A supply chain management is a business approach that focuses on integration, and partnerships, in order to meet customer's need on a timely basis, with relevant and high quality products, produced and delivered in a cost effective manner?

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2.23 SUMMARY

In the world of networked markets, to be innovative, one needs not only to think out of the box, but also think more importantly about reaching equilibrium. ERP Systems helps organizations to maximize their growth & potential. ERP suites can improve and update corporate resource management, but the training and costs involved can be high-priced. ERP is one such vicinity, which has revolutionized business environment from underneath to pinnacle. If you throw a little light on the *Figure 11* there is an elephant, which had been compared with ERP system. Purpose is that ERP had got so much **height + solidity+ depthness**, which in general elephant possess. And whatever functions you are imagining you will search out by a click of mouse.

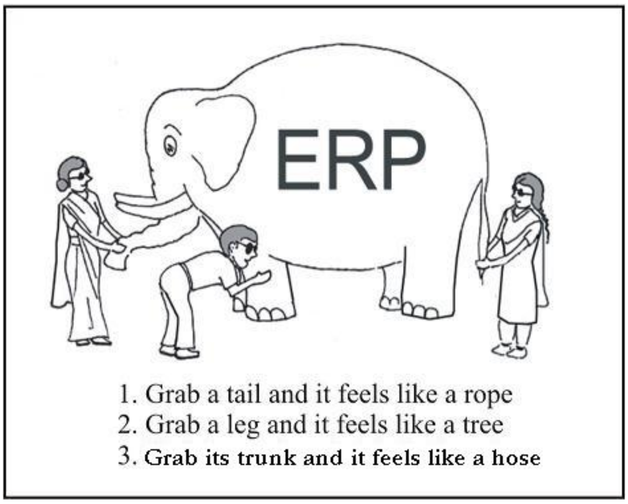

Figure 11: ERP is like an elephant

ERP deployment, management, and evolution are significant operational concerns in today's cost conscious business atmosphere. The performance of enterprise applications designed to streamline ERP processes and operations is dependent on the fundamental network infrastructure. Companies should take a holistic view of their mission critical application, networking environments and include best-in-class networking solutions. Enterprises have long made flamboyant statements about getting closer to their customers and streamlining operations. The ERP, CRM, and SCM applications and the organizations implementing them are at slightest in part, "bringing teeth" to those superior intentions. It is not a trouble-free process, though. In reality, the extremely publicized failures of these initiatives have in some minds polluted these applications and their possible benefits. However, more and more organizations are moving ahead with these initiatives, and the successful organizations will gain from higher margins, better customer relations, and improved back office operations. Organisations are only paying attention in deploying tools and applications that have a quantifiable impact on customer relations, supplier relations, and internal competence; this unit outlines three such tools. The future role of ERP systems may be far more decisive than the reasons for which they have conventionally been adopted. With the speedy emergence of wave after wave of new-fangled technologies, the accessibility of an effectual infrastructure on which to build may be one of the most important factors that facilitate and uphold future competitive advantage. Moreover, the lessons learned in the process of establishing this architecture may be invaluable in concrete manner for technological innovations to move forward. This work has attempted to illustrate that the benefits of ERP systems, beyond well-documented subjective evidence, are rationally rooted in this theory.

2.24 SOLUTIONS/ANSWERS

Check Your Progress 1

1) (Refers to Section No. 2.12)

2) (Refers to Section No. 2.8 and 2.12)

3) (Refers to Section No. 2.5, 2.6, 2.7 and 2.8)

4) (Refers to Section No. 2.13 and 2.14)

5) (Refers to Section No. 2.2, 2.3 and 2.4)

6) (Refers to Section No. 2.4 and 2.5)

7) (Refers to Section No. 2.6)

8) (Refers to Section No. 2.7)

Check Your Progress 2

1) (Refers to Section No. 2.21)

2) (Refers to Section No. 2.22)

3) (Refers to Section No. 2.22 and Table 2.1)

4) (Refers to Section No. 2.22)

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UNIT 3 INTELLIGENCE INFORMATION SYSTEMS

3.0 INTRODUCTION

In today's fast-changing global markets, success is no longer tied to the traditional inputs of labour, capital or land. The new critical resource is inside the heads of employees: knowledge. What a company knows? and how it leverages that knowledge into knowledge management for its use in the organisation. The individual technologies are not in themselves knowledge management solutions. Instead, when brought to market they are typically embedded in a smaller number of solutions packages, each of which is designed to be adaptable to solve a range of business problems. Examples are portals, collaboration software, and distance learning software. In this unit we are aiming at imparting knowledge about this knowledge management and how to use different tools and technologies to achieve the objectives of an organisation.

Business Analytics and Business Intelligence are concerned with the process of collecting and analysing domain-specific data stored in data warehouses to derive valuable insights about customers and emerging markets, and to identify opportunities as well as key drivers to business growth. It is increasingly being seen as the key differentiator that provides a competitive edge to companies across industries. The tools used in Business Analytics are varied. They range from simple slice-and-dice tools to statistical methods such as log it regression, discriminant analysis and multivariate analysis, to more sophisticated tools such as neural networks and optimisation. The application domains are equally varied. How companies, banks, insurance companies and airlines have all been beneficiaries of Business Intelligence is what we are also going to discuss in this unit.

3.1 OBJECTIVES

After going through this unit, you will be able to:

- understand the knowledge management system;
- understand the Artificial Intelligence and its use for business;
- understand the use of business intelligence system for Marketing, Human Resource, and Finance etc;
- design business intellgence system for your organisation;
- understand the use of businesses intelligence tools, and
- understand the use business intelligence reports.

3.2 KNOWLEDGE MANAGEMENT IN ORGANISATION

Knowledge management (KM) is the management of knowledge within organisations. A widely accepted 'working definition' of knowledge management applied in worldwide organisations is "Knowledge Management caters to the critical issues of organisational adaptation, survival, and competence in the face of increasingly discontinuous environmental change.... Essentially, it embodies organisational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings."

This definition not only gives an indication of what Knowledge Management is, but of how its advocates often treat the English language. In simpler terms, Knowledge Management seeks to make the best use of the knowledge that is available to an organisation, creating new knowledge in the process.

It is helpful to make a clear distinction between knowledge on the one hand, and information and data on the other.

Information can be considered as a message. It typically has a sender and a receiver. Information is the sort of stuff that can, at least potentially, be saved onto a computer. Data is a type of information that is structured, but has not been interpreted.

Knowledge might be described as information that has a use or purpose. Whereas information can be placed onto a computer, knowledge exists in the heads of people. Knowledge is information to which intent has been attached.

3.2.1 First and Second Generation Knowledge Management

By the early nineties, it was clear that there were two distinct branches of Knowledge Management.

First Generation Knowledge Management involves the capture of information and experience so that it is easily accessible in a corporate environment. An alternate term is "knowledge capture". Managing this capture allows the system to grow into a powerful information asset.

This first branch had its roots firmly in the use of technology. In this view Knowledge Management is an issue of information storage and retrieval. It uses ideas derived from systems analysis and management theory. This approach led to a boom in consultancies and in the development of so-called knowledge technologies. Typically first-generation Knowledge Management involved developing sophisticated data analysis and retrieval systems with little thought as to how the information they contained would be developed or used. This led to organisations investing heavily in technological fixes that had either little impact or a negative impact on the way in which knowledge was used.

A typical scenario might have seen an organisation install a sophisticated intranet in order to categorise and disseminate information, only to find that the extra work involved in setting up the metadata meant that few within the organisation actually used the intranet. This occasionally led to management mandating the use of the intranet, resulting in resentment amongst staff, and undermining their trust in the organisation. Thus first generation solutions are often counterproductive.

Management theory functions as a branch of Economics, and to a large extent it adopts econometric standards. When it became apparent that it would be useful to be able to manage knowledge, it was natural for managers to attempt to apply their preferred econometric methods to the cause. But econometrics is about commodities and cash flow. It found it therefore necessary to treat knowledge as if it were a commodity.

This, of course, was a surprisingly difficult thing to do, essentially because knowledge is not a commodity but a process. But a suitable epistemology was found, in the form of that developed by Michael Polanyi. Polanyi's epistemology objectified the cognitive component of knowledge – learning and doing – by labelling it *tacit knowledge* and for the most part removing it from the public view. Learning and doing became a 'black box' that was not really subject to management; the best that could be done was to make tacit knowledge explicit.

Its failure to provide any theoretical understanding of how organisations learn new things and how they act on this information meant that first generation Knowledge Management was incapable of managing knowledge creation.

Second Generation Knowledge Management: Faced with the theoretical and practical failure of first generation techniques to live up to its promise, theorists began to look more closely at the ways in which knowledge is created and shared.

Along with this realisation came a change in metaphor. Organisations came to be seen as capable of learning, and so a link grew between learning theory and management.

At the same time hierarchical models of organisational structure were replaced by more organic models, which see effective organisations as capable of structural change in response to their environment.

The advent of *complexity theory* and *chaos theory* provided more metaphors that enable managers to replace models of organisations as integrated systems with models of organisations as complex interdependent entities that are capable of responding to their environment.

Second generation Knowledge Management gives priority to the way in which people construct and use knowledge. It derives its ideas from complex systems, often making use of organic metaphors to describe knowledge growth. It is closely related to organisational learning. It recognises that learning and doing are more important to organisational success than dissemination and imitation.

3.2.2 Knowledge

Knowledge is the awareness and understanding of facts, truths or information gained in the form of experience or learning. Knowledge is an appreciation of the possession of interconnected details which, in isolation, are of lesser value.

Knowledge is a term with many meanings depending on context, but is (as a rule) closely related to such concepts as meaning, information, instruction, communication, representation, learning and mental stimulus.

Knowledge is distinct from simple information. Both knowledge and information consist of true statements, but knowledge is information that has a purpose or use. Philosophers would describe this as information associated with intentionality. The study of knowledge is called epistemology.

A common definition of knowledge is that it consists of justified true belief. This definition derives from Plato's Theaetetus. It is considered as necessary, but not sufficient, conditions for some statement to count as knowledge.

What constitutes knowledge certainty and truth are controversial issues. These issues are debated by philosophers, social scientists, and historians. Ludwig Wittgenstein wrote "On Certainty" — aphorisms on these concepts — exploring relationships between knowledge and certainty. A thread of his concern has become an entire field, the philosophy of action.

Distinguishing *knowing that* from *knowing how*

Suppose that Fred says to you: "The fastest swimming stroke is the front crawl. One performs the front crawl by oscillating the legs at the hip, and moving the arms in an approximately circular motion". Here, Fred has propositional knowledge of swimming and how to perform the front crawl.

However, if Fred acquired this propositional knowledge from an encyclopedia, he will not have acquired the skill of swimming: he has some propositional knowledge, but does not have any procedural knowledge or "know-how". In general, one can demonstrate know-how by performing the task in question, but it is harder to demonstrate propositional knowledge.

Inferential vs. Factual Knowledge

Knowledge may be factual or inferential. Factual knowledge is based on direct observation. It is still not free of uncertainty, as errors of observation or interpretation may occur, and any sense can be deceived by illusions.

Inferential knowledge is based on reasoning from facts or from other inferential knowledge such as a theory. Such knowledge may or may not be verifiable by observation or testing. For example, all knowledge of the atom is inferential knowledge. The distinction between factual knowledge and inferential knowledge has been explored by the discipline of general semantics.

3.2.3 Approach for Successful Implementation of Knowledge Management

Although KM is as an enterprise-wide goal, many companies find success if they kickoff an initiative in one department and then extend the practices throughout other parts of the organisation. Here, we will outline those practices that help ensure a successful KM initiative within the IT help desk or customer contact center. Often KM practices relating to service and support can be defined as knowledge-powered problem resolution — using a knowledge base, knowledge sharing, collaboration and knowledge reuse to efficiently solve customer questions.

A successful knowledge management initiative within a help desk or call center can reduce agent training time and speed new employee ramp up. Knowledge-powered problem resolution enables agents to become more confident and competent sooner than they otherwise would without a KM practice. By having access to a knowledge base, new help desk and customer service agents can get answers to common questions without having to constantly ask other more experienced agents. Customers and end-users benefit from faster problem resolution, and experienced agents can focus on solving more challenging problems.

Customers and end-users also benefit when they have direct access to a knowledge base to solve their own issues without ever contacting an agent. A growing number of people now prefer self-service to live interaction, at least for certain problem types. For some people, self-service fits perfectly into their lifestyle. They are in a hurry and they need a specific piece of information and that's all they want. Say, for example, in a corporate environment, an employee needs to know if there is a Windows 2000 driver for a USB Zip drive. She doesn't want to wait in a queue. She doesn't want to talk to an agent. She just wants to know if there is a driver available and where to find it. In this case, self-service can be superior to agent-assisted service.

Knowledge Management is an evolving discipline that can be affected by new technologies and best practices, but there are some things that we do know for sure. There is a systematic approach to successfully implementing knowledge management and if you analyse what you are trying to accomplish, map out a strategy, garner support from the organisation and have a way to measure it, then you are much more likely to be successful., The outlined 11 points that will serve as a primer to help understand what it takes to have a successful Knowledge Management initiative.

Point 1: Knowledge Management is a discipline

A lot of people think knowledge management is a technology or software solution but it is much more than that; knowledge management is a discipline. Obviously, you have to have a good piece of software or a good system to capture knowledge – but that's not the whole equation. Underestimating what it takes just to capture the knowledge correctly is a big risk, as is underestimating the integration task into your already complex environment.

There are some providers of pre-packaged knowledge out there, but our experience is that while they can be useful to the help desk they are not relevant to customer service centers which have business-specific content needs. In either case, you must ensure you have the adequate resources to create and maintain the content you promise. Creating content is not a one-time project. Also, over time the content must be updated and supplemented as new products or services are supported as shown in *Figure 1*. Empowering agents to add new content as resolutions are discovered is the key to maintaining a robust system.

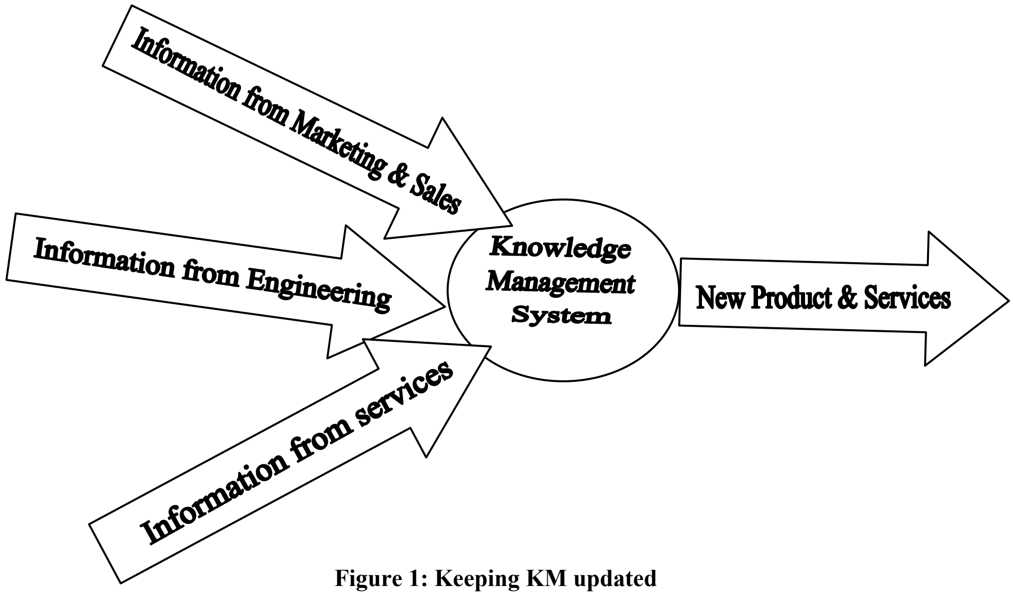


Figure 1: Keeping KM updated

Point 2: One champion is not enough

To be successful, your project must have several champions within the organisation. These are individuals that believe in the project, enthusiastically advocate it and have the clout to "make things happen." Projects that lack a champion generally don't get off the ground. Those with only one champion are also at serious risk.

Losing your champion can spell disaster for your project. This is a real problem for knowledge management projects, due to their continuous duration. If the project champion transfers, retires or leaves the company, the project often loses its momentum and the project may falter as someone else takes it over.

What we like to see when we work with clients is a dual-sponsorship: one at the operational level and one at the executive level. So if an operations manager decides the company really needs knowledge management, that manager should find somebody on the executive staff who will agree to support the vision. By having that dual track of vision the project is more likely to succeed.

Point 3: Cultural change isn't automatic

Buy-in is needed at all levels, and this may require cultural change. The people that are going to use the tools have to be part of the design unless you plan on strong-arming them (and that doesn't work very well). Don't make this management decision in a vacuum. Include some people from the various groups that would directly or indirectly use the system.

Sometimes there is a fear that knowledge management will be used to replace people. If your staff thinks that is what you are trying to do, then you really need to address that head-on. If that is not your intention, you should convince your team that current head count reduction is not the goal. Therefore, you need to look for and plan the motivation for each party. After all, you are asking people to shift from a system where being a tower of knowledge is rewarded, to a system where they share their expertise with everybody on the team.

Each party will have a unique motivation to embrace knowledge management. For example, in a technical support environment, a frontline tech will have a different motivational schema than a 3rd level technician. The frontline tech is not going to have to ask the 2nd line tech as many questions, and can resolve more problems faster. The 2nd level tech is not going to get as many of the common questions. Level 3 researchers won't have to start at ground zero when handed a problem by level 2, because they know that all the intermediate steps have been covered. So as you look across the organisation everybody has a different interest and you have to protect all of them.

Failing to see how knowledge management is going to fit into the rest of the organisation is a mistake. You must invest the time and energy to understand the culture, identify motivations and ensure change happens where needed.

Point 4: Create a change management plan

If your employees are not already sharing information, you will need a change management plan because you are asking people to do their jobs differently. The change management plan specifies how you will gain acceptance of knowledge management within the organisation. Let's say you are a call center manager and you measure your employees' performance by call handle time and number of cases closed. Now you are going to be asking them to use a knowledge base on every call or email interaction – thus asking them to change the way they perform their job on a daily basis. Also, if you don't make changes to their performance reviews and compensation, there may be friction because you're asking them to do one thing but you are judging them by another set of rules. As part of the overall change management plan you need to update job descriptions, feedback sessions and performance reviews to reflect the new workflow. Neglecting to make these changes may foster acceptance issues with your team members.

Point 5: Stay strategic

Knowledge management is a strategic endeavour, not just a project. I prefer to call it a strategic initiative as opposed to a project because a project implies a finite timeline. With KM you are never really done; you initiate it and you build it and then it is online and you maintain it.

In our practice we look for our clients to have a strategic goal for the project rather than a tactical goal. If you are looking to shorten handle time that's a tactical motivation and you're not as likely to be willing to go through the steps that a successful enterprise rollout would take. But if it is a strategic initiative, especially something that is top-down motivated (for instance improving customer service or improving employee satisfaction) then there is a better value statement involved and you are not relying on changing one metric. So you might see improvement in individual metrics like handle time and resolution rates but their value is limited compared to the return from becoming a collaborative knowledge sharing organisation.

To get going, decide what goals you are trying to accomplish and why. Then try to identify a solution and methodology that will help you attain those goals in your environment. Sometimes people within an organisation may say that a KM initiative is nice-to-have, but an economic downturn might slow the process down or defer it — thus, being counterproductive when resources are scarce. But I think it's counterproductive to consider KM a nice-to-have because the rewards are equally beneficial during both a downturn and the inevitable upturn. If you wait until the upturn then you will be forced to play catch up as your call volumes increase and your email volume doubles; that's not the time to introduce a knowledge-powered system or build a knowledge base. It's not necessary to hire more employees if you have resources that are not 100% utilized or if you encourage your agents to contribute knowledge during their daily workflow.

Point 6: Pick a topic, go in-depth, and keep it current

We advise that you pick one area that needs improvement or has limited resources, and then build a robust knowledge base for that subject matter. Use that experience to learn about implementing knowledge in your organisation; do one call center or one product group and learn from there. It is much better to be comprehensive for a narrow topic than fail to get enough depth. Sometimes an enterprise initiative is needed right away, and it can be done successfully, but it can involve a larger resource commitment to do a full-scale project all at once. Remember, the depth of your knowledge base truly depends upon your customers' needs.

Today's systems should enable agents to contribute new knowledge during their natural workflow. This is critical to ensure that solutions that are not currently in the system can be quickly added once the resolution has been determined. It's also important to remember that regular and timely maintenance of the knowledge base is the key to success. You should also consider appointing resources to maintain the knowledge. Be sure to build in a mechanism that identifies gaps in content (information sought but not found), and a process for filling those gaps. If people repeatedly fail to find what they are looking for they will stop using the system.

Point 7: Don't get hung up on the limitations

Certain types of knowledge are very well suited to quickly harvesting into a knowledge base. Company processes or technical procedures are well suited for knowledge management. By populating a knowledge base with this type of information and making it available to employees and customers, an organisation can shorten or even avoid many calls. Organisations can also use a KM system to access existing unstructured sources of information that may already exist on a corporate network, intranet or within an existing call center or help desk system. It's important to note that experienced agents can certainly benefit from access to both structured knowledge and unstructured information because they're more likely to be able to pinpoint a solution within an unstructured document. However, level 1 agents or end-users accessing the knowledge base through self-service, may not find these sources of unstructured information helpful because they don't have the expertise to decipher the information quickly.

In addition to sources of knowledge, the specific type of information is also important to consider. The craftsmanship or expertise that a true expert has is much more difficult to capture. A master craftsman has a huge body of knowledge. S/he tends to "chunk" their knowledge and can't tell you the steps they use when they make a decision in their field; they just do it. Much like tying your shoe, you do it everyday but when you have to explain it its tough because you have internalized the process. I think that is where the breakdown is for harvesting expertise. We think a KM initiative could be somewhat limited because of the nature of complex knowledge, and thankfully we will always need human expertise. However, when it comes to a successful initiative, it's important to first determine what knowledge can be easily added to the system and then provide agents or a knowledge manager with the tools to add this step-by-step complex information to the system, ensuring that even difficult questions can be answered accurately.

Point 8: Set expectations or risk extinction

A big pitfall is the failure of knowledge management proponents in helping executive management set appropriate expectations. Customers, employees and management alike must know what they are going to get out of knowledge management, what it will take to get those results and how success will be measured. Measurement is where most organisations fail because they are doing things that were not measured before. So a year from now, you've built this thing, it's up and running and everyone loves it and your boss says "where's my return?" If you don't have a measurement system in place then you will have a hard time answering his or her question – especially for the new metrics that didn't exist before. You probably measured handle time, abandon rates, and similar operational metrics. But you may not be measuring call avoidance or knowledge usage, which affects ultimately the ability to measure resolution rates.

In addition to setting management expectations you have to set customer and end-user expectations. For example, if you are going to provide customers with Web self-service for one specific product then you must include the known problems that they are going to encounter in the knowledge base. In that situation you are better off to set their expectations that the knowledge base covers only that product and no other. Customers pose the same extinction risk that your employees do. If they visit the site a few times and they can't find an accurate or appropriate answer they will probably not return again.

Point 9: Integrate KM into existing systems

Typically, organisations that are implementing knowledge management already have an established data center, so they are not only building a knowledge base – they must also integrate it into their existing environment – their call tracking system, IVR system, email, remote diagnostics and other support systems.
When selecting a KM system, consider systems that have open architectures and proven integrations into existing call center and help desk tools to ensure a successful implementation. Also, processes will be affected, requiring change to reporting and measurement systems as well. Integrate reporting capabilities where possible to best understand how the combined systems are affecting the effectiveness of your support operations.

Point 10: Educate your self-service users

You've created your KM plan, determined the critical knowledge to include, initiated a plan to garner cultural acceptance, trained your agents and pinpointed key sources of knowledge – finally you need to educate your self-service users on how to find and access support information online to ensure a satisfying experience.

There are many ways to "push" your self-service capabilities out to your end-user audience. Traditional marketing techniques should be employed to promote this valuable service, such as email, online newsletters or direct mail. Encourage users to visit your online support site by making it easy to find and access the knowledge base. Be sure to include the site URL and directions for obtaining a login, if needed, in your marketing communications.

Another method is to encourage your agents to end support calls by informing the user of the support site. "Thanks for calling today, I'm glad that I could help you solve your problem. By the way, we now have a Web self-service site if you'd like to search the knowledge base. You can find it at www.ABC-Support.com and you can obtain a login by clicking the request login button on that page."

Finally, make sure your Internet or intranet site includes an easy-to-find link to your Web self-service site. A twist on the old saying, "If they can't find it, they won't come." So make it easy to find, easy to access and easy to use.

Point 11: Become a knowledge-enabled organisation

We think it is inevitable that knowledge management will have a high adoption rate in the next few years. Over time to remain competitive it will be essential to be "knowledge-enabled." Just a few years ago email was not a common method for seeking customer service; now customers demand the ability to contact you through channels other than the phone. Going forward, as customers deal with companies that are knowledge-enabled and can quickly and efficiently answer their questions, they are going to expect a greater level of service in all of their support interactions.

The bottom line can be summarized with a quote from Gartner, Inc. – "Those enterprises that include KM processes as part of their customer relationship management initiatives have a higher probability of success than those that don't".

3.3 CREATING, DEVELOPING AND SHARING KNOWLEDGE

Knowledge flows comprise the set of processes, events and activities through which data, information, knowledge and meta-knowledge are transformed from one state to another. To simplify the analysis of knowledge flows, the framework described here is based primarily on the Knowledge Model. The model organizes knowledge flows into four primary activity areas: knowledge creation, retention, transfer and utilisation (*Figure 2*).

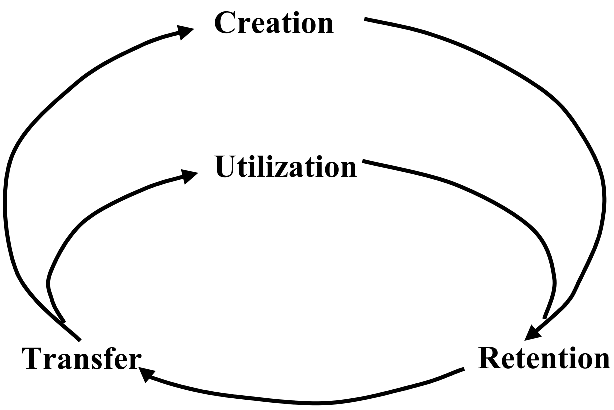


Figure 2: Knowledge model

Knowledge Creation: This comprises activities associated with the entry of new knowledge into the system, and includes knowledge development, discovery and capture.

Knowledge Retention: This includes all activities that preserve knowledge and allow it to remain in the system once introduced. It also includes those activities that maintain the viability of knowledge within the system.

Knowledge Transfer: This refers to activities associated with the flow of knowledge from one party to another. This includes communication, translation, conversion, filtering and rendering.

Knowledge Utilisation: This includes the activities and events connected with the application of knowledge to business processes.

Let us, look at the basic processes of **knowledge creation and sharing** within organisations and what type of technologies can be applied to knowledge management and to assess their actual or potential contribution.

3.3.1 Knowledge Creation and Sharing

A set of systematic and disciplined actions that an organisation can take to obtain the greatest value from the knowledge available is given the name Knowledge management. “Knowledge” in this context includes both the experience and understanding of the people in the organisation and the information artifacts, such as documents and reports, available within the organisation and in the world outside. Effective knowledge management typically requires an appropriate combination of organisational, social, and managerial initiatives along with, in many cases, deployment of appropriate technology.

To structure the discussion of processes involved in knowledge creation and sharing and technologies involved, it is helpful to classify the technologies by reference to the notions of **tacit** and **explicit knowledge**.

- **Tacit knowledge** is what the knower knows, which is derived from experience and embodies beliefs and values. Tacit knowledge is actionable knowledge, and therefore the most valuable. Furthermore, tacit knowledge is the most important basis for the generation of new knowledge; however, the key to knowledge creation is the mobilisation and conversion of tacit knowledge.

- **Explicit knowledge** is represented by some artifact, such as a document or a video, which has typically been created with the goal of communicating with another person.

  Both forms of knowledge are important for organisational effectiveness.

  Now, let us look at processes by which knowledge is transformed between its tacit and explicit forms, as shown in *Figure 3*. Organisational learning takes place as individuals participate in these processes, since by doing so their knowledge is shared, articulated, and made available to others. **Creation of new knowledge** takes place through the processes of combination and internalisation. As shown in *Figure 3*, the processes by which knowledge is transformed within and between forms usable by people are:

  - **Socialisation (tacit to tacit):** Socialisation includes the shared formation and communication of tacit knowledge between people, e.g., in meetings. Knowledge sharing is often done without ever producing explicit knowledge and, to be most effective, should take place between people who have a common culture and can work together effectively. Thus, tacit knowledge sharing is connected to ideas of communities and collaboration. A typical activity in which tacit knowledge sharing can take place is a team meeting during which experiences are described and discussed, often informal, in which information technology (IT) plays a minimal role. However, an increasing proportion of meetings and other interpersonal interactions use on-line tools known as groupware. These tools are used either to supplement conventional meetings, or in some cases to replace them. To what extent can these tools facilitate formulation and transfer of tacit knowledge?

TACIT-TO-TACIT Socialisation Team meeting & discussion	**TACTI-TO-EXPLICIT** Externalisation Team meeting & Answer Questions
EXPLICIT-TO-TACIT Internalisation Learning-from-Reports	**EXPLICIT-TO-EXPLICIT** Combination E-mail/Reports

Figure 3: Conversion of Knowledge from Tacit-to-Explicit form and *vice-versa*, Processes & Techniques

Groupware: Groupware is a fairly broad category of application software that helps individuals to work together in groups or teams. Groupware can to some extent support all four of the facets of knowledge transformation. To examine the role of groupware in socialization we focus on two important aspects: shared experiences and trust.

Shared experiences are an important basis for the formation and sharing of tacit knowledge. Groupware provides a synthetic environment, often called a virtual space, within which participants can share certain kinds of experience; for example, they can conduct meetings, listen to presentations, have discussions, and share documents relevant to some task. Indeed, if a geographically dispersed team never meets face to face, the importance of shared experiences in virtual spaces is proportionally enhanced. An example of current groupware is Lotus Notes, which facilitates the sharing of documents and discussions and allows various applications for sharing information and conducting asynchronous discussions to be built. Groupware might be thought to mainly facilitate the combination process, i.e., sharing of explicit knowledge. However, the selection and discussion of explicit knowledge to some degree constitutes a shared experience.

A richer kind of shared experience can be provided by applications that support **real-time on-line meetings,** a more recent category of groupware. On-line meetings can include video and text-based conferencing, as well as synchronous communication and chat. Text-based chat is believed to be capable of supporting a group of people in knowledge sharing in a conversational mode. Commercial products of this type include Lotus Sametime and Microsoft NetMeeting. These products integrate both instant messaging and on-line meeting capabilities. Instant messaging is found to have properties between those of the personal meeting and the telephone: it is less intrusive than interrupting a person with a question but more effective than the telephone in broadcasting a query to a group and leaving it to be answered later.

Some of the limitations of groupware for tacit knowledge formation and sharing have been highlighted by recent work on the closely related issue of the degree of trust established among the participants. It was found that videoconferencing (at high resolution—not Internet video) was almost as good as face-to-face meetings, whereas audio conferencing was less effective and text chat least so. These results suggest that a new generation of videoconferencing might be helpful in the socialization process, at least in so far as it facilitates the building of trust. But even current groupware products have features that are found to be helpful in this regard. In particular, access control, which is a feature of most commercial products, enables access to the discussions to be restricted to the team members if appropriate, which has been shown to encourage frankness and build trust.

- **Externalisation (tacit to explicit):** By its nature, tacit knowledge is difficult to convert into explicit knowledge. Through conceptualization, elicitation, and ultimately articulation, typically in collaboration with others, some proportion of a person's tacit knowledge may be captured in explicit form. Typical activities in which the conversion takes place are in dialog among team members, in responding to questions, or through the elicitation of stories.

  The conversion of tacit to explicit knowledge (externalization) involves forming a shared mental model, then articulating through dialog. Collaboration systems and other groupware (for example, specialized brainstorming applications) can support this kind of interaction to some extent.

On-line discussion databases are another potential tool to capture tacit knowledge and to apply it to immediate problems. It needs to be noted that team members may share knowledge in groupware applications. To be most effective for externalization, the discussion should be such as to allow the formulation and sharing of metaphors and analogies, which probably requires a fairly informal and even freewheeling style. This style is more likely to be found in chat and other real-time interactions within teams.

Newsgroups and similar forums are open to all, unlike typical team discussions, and share some of the same characteristics in that questions can be posed and answered, but differ in that the participants are typically strangers. Nevertheless, it is found that many people who participate in newsgroups are willing to offer advice and assistance, presumably driven by a mixture of motivations including altruism, a wish to be seen as an expert, and the gratitude and positive feedback contributed by the people they have helped.

3.3.2 Capturing Knowledge

Once tacit knowledge has been conceptualized and articulated, thus converting it to explicit knowledge, capturing it in a persistent form as a report, an e-mail, a presentation, or a Web page makes it available to the rest of the organisation. Technology already contributes to knowledge capture through the ubiquitous use of word processing, which generates electronic documents that are easy to share via the Web, e-mail, or a document management system. Capturing explicit knowledge in this way makes it available to a wider audience, and "improving knowledge capture" is a goal of many knowledge management projects.

- ***Combination: (explicit to explicit):*** Explicit knowledge can be shared in meetings, via documents, e-mails, etc., or through education and training. The use of technology to manage and search collections of explicit knowledge is well established. However, there is a further opportunity to foster knowledge creation, namely to enrich the collected information in some way, such as by reconfiguring it, so that it is more usable. An example is to use text classification to assign documents automatically to a subject schema. A typical activity here might be to put a document into a shared database.There can be little doubt that the phase of knowledge transformation best supported by IT is combination, because it deals with explicit knowledge. We can distinguish the challenges of knowledge management from those of information management by bearing in mind that in knowledge management the conversion of explicit knowledge from and to tacit knowledge is always involved.

- ***Internalisation (explicit to tacit):*** In order to act on information, individuals have to understand and internalize it, which involves creating their own tacit knowledge. By reading documents, they can to some extent re-experience what others previously learned. By reading documents from many sources, they have the opportunity to create new knowledge by combining their existing tacit knowledge with the knowledge of others. However, this process is becoming more challenging because individuals have to deal with ever-larger amounts of information. A typical activity would be to read and study documents from a number of different databases.

These processes do not occur in isolation, but work together in different combinations in typical business situations. For example, knowledge creation results from interaction of persons and tacit and explicit knowledge. Through interaction with others, tacit knowledge is externalized and shared. Although individuals, such as employees, for example, experience each of these processes from a knowledge management and therefore an organisational perspective, the greatest value occurs from their combination since, as already noted, new knowledge is thereby created, disseminated, and internalized by other employees who can therefore act on it and thus form new experiences and tacit knowledge that can in turn be shared with others and so on. Since all the processes of *Figure 3* are important, it seems likely that knowledge management solutions should support all of them, although we must recognise that the balance between them in a particular organisation will depend on the knowledge management strategy used.

Table 1 shows some examples of technologies that may be applied to facilitate the knowledge conversion processes of *Figure 3*. The individual technologies are not in themselves knowledge management solutions. Instead, when brought to market they are typically embedded in a smaller number of solutions packages, each of which is designed to be adaptable to solve a range of business problems. Examples are portals, collaboration software, and distance learning software. Each of these can and does include several different technologies.

Table 1: Examples of technologies that can support or enhance the transformation of knowledge

Tacit to Tacit	**Tacit to Explicit**
E-meetings	Answering questions
Synchronous collaboration (chat)	Annotation
Explicit to Tacit	**Explicit to Explicit**
Visualization	Text search
Browsable video/audio of presentations	Document categorization

It is found that the strongest contribution to current solutions is made by technologies that deal largely with explicit knowledge, such as search and classification.

Contributions to the formation and communication of tacit knowledge, and support for making it explicit, are currently weaker, although some encouraging developments are highlighted, such as the use of text-based chat, expertise location, and unrestricted bulletin boards.

Knowledge capture stages

Knowledge may be accessed, or captured, at three stages: before, during, or after knowledge-related activities. For example, individuals undertaking a new project for an organisation might access KM resources to learn best practices and lessons learnt for similar projects undertaken previously, access the KM network again during the project implementation to seek advice on issues encountered, and access the system afterwards for advice on after-project actions and review activities. Similarly, knowledge may be captured and recorded into the system before the project implementation, for example, as the project team learns information and lessons during the initial project analysis. Similarly, lessons learnt during the project operation may be entered into the KM system, and after-action reviews may lead to further insights and lessons being recorded in the KM system for future access.

3.3.3 Knowledge Transfer and Organisation

In the Organisational development area of organisational learning, a practical problem is that of **knowledge transfer**, how to get some packet of knowledge, that exists in one part of the organisation, into another (or all other) parts of the organisation. It's more than just a communications problem. If it were merely that, then a memo, an e-mail or a meeting would accomplish the knowledge transfer.

Challenges

What complicates knowledge transfer? There are many factors, including:

- geography
- language

- areas of expertise
- internal conflicts (e.g., professional territoriality)
- generational differences
- union-management relations
- incentives
- the use of visual representations to transfer knowledge (Knowledge visualization)

Process

- identifying the key knowledge holders within the organisation
- motivating them to share
- designing a sharing mechanism to facilitate the transfer
- executing the transfer plan
- measuring to ensure the transfer
- applying the knowledge transferred

3.3.4 Drivers of Knowledge Management

There are a number of 'drivers', or motivations, leading to organisations undertaking a Knowledge Management program. Perhaps first among these are to gain the competitive advantage that comes with improved or faster learning and new knowledge creation. KM programs may lead to greater innovation, better customer experiences, consistency in best practices and knowledge access across a global organisation, as well as many other benefits, and KM programs may be driven with these goals in mind.

Considerations driving a knowledge management program might include:

- making available increased knowledge content in the development and provision of products and services.
- achieving shorter new product development cycles.
- facilitating and managing organisational innovation.
- leverage the expertise of people across the organization.
- Benefiting from 'network effects' as the number of productive connections between employees in the organisation increases and the quality of information shared increases.
- managing the proliferation of data and information in complex business environments and allowing employees to rapidly access useful and relevant knowledge resources and best practice guidelines.
- facilitate organisational learning.
- managing intellectual capital and intellectual assets in the workforce (such as the expertise and know-how possessed by key individuals) as individuals retire – in larger numbers than they have in a long time - and new workers are hired.

Knowledge Management enablers

Historically, there have been a number of *technologies* 'enabling, or facilitating KM practices in the organisation, including expert systems, knowledge bases, software help desk tools, document management systems and other IT systems supporting organisational knowledge flows.

The advent of the internet brought with it further enabling technologies, including E-learning, web conferencing, collaborative software, Content management systems, corporate 'Yellow pages' directories, email lists, Wikis, Blogs, and other technologies. Each enabling technology can expand the level of inquiry available to an employee, while providing a platform to achieve specific goals or actions. The practice of KM will continue to evolve with the growth of collaboration applications available by IT and through the Internet. Since its adoption by the mainstream population and business community, the Internet has led to an increase in creative collaboration, learning and research, e-commerce, and instant information.

There are also a variety of *organisational* enablers for KM programs, including Communities of Practice, before-, after- and during- action reviews, peer assists, information taxonomies, coaching and mentoring, and so on.

3.3.5 Knowledge Representation

Knowledge representation is a central problem in arranging knowledge. It is needed for library classification and processing concepts in an information system.

There are difficulties in the field of artificial intelligence. The problem consists of how to store and manipulate knowledge in an information system in a formal way so that it may be used by mechanisms to accomplish a given task. Examples of applications are expert systems, machine translation systems, computer-aided maintenance systems and information retrieval systems (including database front-ends).

Some people think it would be best to represent knowledge in the same way that it is represented in the human mind, which is the only known working intelligence so far, or to represent knowledge in the form of human language. Unfortunately, we don't know how knowledge is represented in the human mind, or how to manipulate human languages in the same way as the human mind.

For this reason, various artificial languages and notations have been proposed for representing knowledge. They are typically based on logic and mathematics, and have easily parsed grammars to ease machine processing.

The recent fashion in knowledge representation languages is to use XML as the low-level syntax. This tends to make the output of these KR languages easy for machines to parse, at the expense of human readability.

First-order predicate calculus is commonly used as a mathematical basis for these systems, to avoid excessive complexity. However, even simple systems based on this simple logic can be used to represent data which is well beyond the processing capability of current computer systems:

Examples of notations:

- DATR is an example for representing lexical knowledge
- RDF is a simple notation for representing relationships between objects

Examples of artificial languages intended for knowledge representation include:

- CycL
- Loom
- OWL
- KM

Techniques of knowledge representation

Semantic networks may be used to represent knowledge. Each node represents a concept and the arcs are used to define relations between the concepts.

From the earliest times, the knowledge frame or just *frame* has been used. A frame consists of *slots* which contain values; for instance, the frame for *house* might contain a *color* slot, *number of floors* slot, etc.

Frames can behave something like object-oriented programming languages, with inheritance of features described by the "is-a" link. However, there has been no small amount of inconsistency in the usage of the "is-a" link: Ronald J. Brachman wrote a paper titled "What IS-A is and isn't", wherein 29 different semantics were found in projects whose knowledge representation schemes involved an "is-a" link. Other links include the "has-part" link.

Frame structures are well-suited for the representation of schematic knowledge and stereotypical cognitive patterns. The elements of such schematic patterns are weighted unequally, attributing higher weights to the more typical elements of a schema. A pattern is activated by certain expectations: If a person sees a big bird, he or she will classify it rather as a sea eagle than a golden eagle, given his or her "sea-scheme" is currently activated.

Frames representations are more object-centers than semantic networks: all the facts and properties of a concept are located in one place - there is no need for costly search processes in the database.

Frames suffer from the frame problem of knowledge linking.

A *script* is a type of frame that describes what happens temporally; the usual example given is that of describing going to a restaurant. The steps include waiting to be seated, receiving a menu, ordering, etc.

Check Your Progress 1

1) State whether True or False:

   a) Knowledge Management seeks to make the best use of the knowledge that is available to an organisation, creating new knowledge in the process. True ☐ False ☐
   b) Explicit knowledge is represented by some artifact, such as a document or a video, which has typically been created with the goal of communicating with another person. True ☐ False ☐
   c) Explicit knowledge is the most important basis for the generation of new knowledge. True ☐ False ☐
   d) Socialization Process is involved for transfer of Tacit to Tacit information. True ☐ False ☐
   e) Internalization Process is involved for conversion/ transfer of Tacit to Explicit information. True ☐ False ☐
   f) Externalization Process is involved for conversion/ transfer of Explicit to Tacit information. True ☐ False ☐
   g) Combination Process is involved for conversion/ transfer of Explicit to Explicit information. True ☐ False ☐

2) Answer the Following Question:

   a) What are the factors which make knowledge management implementation difficult in an organisation?
   ……………………………………………………………………………
   ……………………………………………………………………………
   ……………………………………………………………………………

3.4 ARTIFICIAL INTELLIGENCE IN BUSINESS

Intelligence is the capability to solve perceptual problems. By the term "perceptual", we mean individual, special, random, fuzzy, sensory, and/or emotional. Solving such problems requires accumulation, induction and inference of experiences to form new knowledge.

Artificial intelligence (abbreviated **AI**) is defined as intelligence exhibited by an artificial entity. Such an entity is generally computer-controlled; therefore artificial intelligence in this context is pre-programmed. Humans use intuition and viewpoints to make judgments and choices instead of using precise rules or procedures. However, almost none of those used by human beings can be done programmatically. In conclusion, we can say that no matter how powerful a computer might be, if it works only upon a given set of rules/programs, it is not regarded as having real intelligence.

Research in AI is concerned with producing machines to automate tasks requiring intelligent behavior. Examples include control, planning and scheduling, the ability to answer diagnostic and consumer questions, handwriting, speech, and facial recognition. As such, it has become a scientific discipline, focused on providing solutions to real life problems. AI systems are now in routine use in economics, medicine, engineering and the military, as well as being built into many common home computer software applications, traditional strategy games like computer chess and other video games.

Schools of thought

AI is divided roughly into two schools of thought: Conventional AI and Computational Intelligence (CI).

Conventional AI mostly involves methods now classified as machine learning, characterized by formalism and statistical analysis. This is also known as symbolic AI, logical AI, neat AI and Good Old Fashioned Artificial Intelligence (GOFAI). AI Methods include

- *Expert systems*: apply reasoning capabilities to reach a conclusion. An expert system can process large amounts of known information and provide conclusions based on them.
- Case based reasoning.
- Bayesian networks.
- Behaviour based AI: a modular method of building AI systems by hand.

Computational Intelligence involves iterative development or learning (e.g. parameter tuning e.g., in connectionist systems). Learning is based on empirical data and is associated with non-symbolic AI, scruffy AI and soft computing. Methods mainly include: Neural networks: systems with very strong pattern recognition capabilities.

- **Fuzzy systems:** techniques for reasoning under uncertainty, has been widely used in modern industrial and consumer product control systems.

- **Evolutionary computation:** applies biologically inspired concepts such as populations, mutation and survival of the fittest to generate increasingly better solutions to the problem. These methods most notably divide into evolutionary algorithms (e.g., genetic algorithms) and swarm intelligence (e.g., ant algorithms).

With hybrid intelligent systems attempts are made to combine these two groups. Expert inference rules can be generated through neural network or production rules from statistical learning such as in ACT-R.

A promising new approach called intelligence amplification tries to achieve artificial intelligence in an evolutionary development process as a side-effect of amplifying human intelligence through technology.

History of commercial AI applications

It was not until the late 1970s that the first commercial AI based System, XCON (Expert System), was developed. At that time, practical, commercial applications of AI were still rare. In the early 1980s, Fuzzy Logic techniques were implemented on Japanese subway trains and in a production application by a Danish cement manufacturer. Commercial AI products were only returning a few million dollars in revenue at this time.

The Expert Systems that companies are starting to use, and the AI groups in many large companies, were formed in the mid-1980s. Expert Systems started to show limits on the amount of rules they can work with, and 1986 sales of AI-based hardware and software were $425 million (WFMO, 2001). Likewise, interest in using Neural Nets in business applications developed. By the end of the 1980s, Expert Systems were increasingly used in industry, and other AI techniques were being implemented, often unnoticed but with beneficial effect (WFMO, 2001). AI revenues reach $1 billion (MIT, Timeline of AI, 2001).

In the early 1990s, AI applications such as automatic scheduling software, software to manage information for individuals, automatic mortgage underwriting systems, and automatic investment decision makers were used. In the mid-1990s, AI software to improve the prediction of daily revenues and staffing requirements for a business, credit fraud detection systems, and support systems were developed and used. It was not until the late-1990s that the applications such as data mining tools, e-mail filters, and web crawlers were developed and generally accepted.

Artificial intelligence methods for business use

We will discuss AI methods used in business namely Expert System, Artificial Neural Network (ANN), and Evolutionary Algorithm (EA) and move on to Hybrid Systems, (the AI methods that are used to complement, or in combination with these); Fuzzy Logic and Data Mining.

Expert System: *One of the accepted definition of Expert System is "A computer program with the expertise embodied in it, based on interview by a knowledge worker of the expert in that domain".* During the "knowledge acquisition" it will not only be the "knowledge" of experts that will be cloned and built into these systems, but also their intuition and the way that they reason, so that the best options can be selected under any given set of circumstances.

An Expert System can be developed by: Expert System Shell software that has been specifically designed to enable quick development, AI languages, such as LISP and Prolog or through the conventional languages, such as Fortran, C++, Java, etc.

While the Expert System concept may sound futuristic, one of the **first commercial Expert Systems**, called Mycin, was already in business use in 1974. Mycin, which was created by Edward H. Shortliffe at Stanford University, is one of the most famous Expert Systems. Mycin was designed as a medical diagnosis tool giving information concerning a patient's symptoms and test results; Mycin attempted to identify the cause of the patient's infection and suggested treatments. It was observed by some users that Mycin produced better analysis than medical students or practising doctors, provided its limitations were observed. Another example of an Expert System is Dendral, a computerized chemist. According to the Massachusetts Institute of Technology, the success of Dendral helped to convince computer science researchers that systems using heuristics were capable of mimicking the way human experts solve problems.

As regards to **Potential Applications for an Expert System**, these have been developed for a variety of reasons, including: the archiving of rare skills, preserving the knowledge of retiring personnel, and to aggregate all of the available knowledge in a specific domain from several experts, (when no single expert has complete knowledge of that domain). Perhaps an expert's knowledge is needed more frequently than the expert can handle, or in places that the expert cannot travel to. The Expert System can train new employees or eliminate large amounts of the monotonous work humans do, thereby saving the expert 'time for situations requiring his or her expertise. In our opinion the only limit on the possible applications of stored knowledge in an Expert System is what the mind can imagine.

We may Conclude that the Expert System is an AI application that takes decisions based on knowledge and inference (the ability to react on the knowledge), as defined by experts in a certain domain and to solve problems in that domain. The Expert System normally falls under the definition of Weak AI, and is one of the AI techniques that has been easiest for companies to embrace. Commercial Expert Systems were developed during the 1970s, and continue to be used by companies. One advantage of an Expert System is that it can explain the logic behind a particular decision, why particular questions were asked, and/or why an alternative was eliminated. That is not the case with other AI methods.

Artificial Neural Network: Sometimes the following distinction is made between the terms "Neural Network" and "Artificial Neural Network". "Neural network" indicates networks that are hardware based and "Artificial Neural Network" normally refers to those which are software-based. In the following paragraphs, "Artificial Neural Network" is sometimes referred to as "Neural Network" or "Neural Computing". Neural Networks are an approach, which is inspired by the architecture of the human brain. In the human brain a neural network exists, which is comprised of over 10 billion neurons; each neuron then builds hundreds and even thousands of connections with other neurons.

*"**Neural computing** is defined as the study of networks of adaptable nodes which, through a process of learning from task examples, store experimental knowledge and make it available for use.".* As a Neural Network (NN) is designed, rather than being programmed, the systems learn to recognize patterns. Learning is achieved through repeated minor modifications to selected neuron weights (The weight is equal to the importance of the neuron). NN typically starts out with randomized weights for all their neurons. This means that they do not "know" anything, and must be trained. Once a NN has been trained correctly, it should be able to find the desired output to a given input; however, it cannot be guaranteed that a NN will produce the correct output pattern. NN learns by either a supervised or an unsupervised learning process.

i) **The Supervised Learning Process:** A supervised learning process has a target pattern (desired output). While learning different input patterns, the weight values are changed dynamically until their values are balanced, so that each input will lead to the desired output. There are two supervised learning algorithms: Forward, and Back-propagation, Learning Algorithms.

ii) An **unsupervised Neural Network** has no target outputs. During the learning process, the neural cells organise themselves in groups, according to input pattern. The incoming data is not only received by a single neural cell, but also influences other cells in its neighbourhood. The goal is to group neural cells with similar functions close together. Self-organisation Learning Algorithms tend to discover patterns and relationships in that data.

Artificial Neural Network Techniques: There are many kinds of Artificial Neural Networks. No one knows exactly how many. This dissertation only examines the most common ones. (i) Perceptron, (ii) Multi-Layer-Perceptron, (iii) Backpropagation Net, (iv) Hopfield Net Physicist, and (v) Kohonen Feature Map.

ANN as a method of Forecasting: "Forecasting is essential to business. NN does this job better than traditional forecasting methods. The advantages of ANN over traditional statistical forecasting methods are that ANN do not have to fulfill any statistical assumptions and the ability to handle non-linearity, which are common in business. Further advantages are that ANN is easy to learn and use, and normally requires less data preparation.

We can conclude that ANN is inspired by the architecture of the human brain, and learns to recognise patterns through repeated minor modifications to selected neuron weights. There are many kinds of ANN techniques that are good at solving problems involving patterns, pattern mapping, pattern completion, and pattern classification.

ANN pattern recognition capability makes it useful to forecast time series in business. A Neural Network can easily recognise patterns that have too many variables for humans to see. They have several advantages over conventional statistical models: they handle noisy data better, do not have to fulfil any statistical assumptions, and are generally better at handling large amounts of data with many variables.

A problem with Neural Networks is that it is very difficult to understand their internal reasoning process, however, this is not entirely accurate. It is possible to get an idea about the learned ANN variables' elasticity. By changing one variable at a time, looking at the changes in the output pattern during that time, at least some information regarding the importance of the different variables will be visible. Neural Networks can be very flexible systems for problem solving.

Evolutionary Algorithm is "an algorithm that maintains a population of structures (usually randomly generated initially) that evolves according to rules of selection, recombination, mutation and survival referred to as genetic operators. A shared "environment" determines the fitness or performance of each individual in the population. It also tells us that the fittest individuals are more likely to be selected for reproduction (retention or duplication), while recombination and mutation modifies those individuals, yielding potentially superior ones.

Branches of Evolutionary Algorithms: There are currently four main paradigms in (EA) research: Genetic Algorithm (GA), with two sub-classes and Genetic Programming (GP), Evolutionary Programming, and Evolution Strategy.

- **Genetic Algorithm** (GA), is inspired by Darwin's theory about evolution. Solution to a problem solved by genetic algorithms is evolved. Algorithm is started with a set of solutions (represented by chromosomes) called population. Solutions from one population are taken and used to form a new population. This is motivated by a hope, that the new population will be better than the old one. Solutions are selected to form new solutions (offspring) according to their fitness — the more suitable they are the more chances they have to reproduce. This is repeated until some condition (for example, "number of populations or improvement of the best solution) is satisfied."
- **Genetic programming** (GP) is a programming technique that extends the Genetic Algorithm to the domain of whole computer programs. In GP, populations of programs are genetically bred to solve problems.

- **Evolutionary Programming and Evolution Strategy:** Evolution programming uses mutations to evolve populations. Is a stochastic optimisation strategy similar to Genetic Algorithm, but instead places emphasis on the behavioural linkage between parents and their offspring, rather than seeking to emulate specific Genetic Operators as observed in nature. Evolutionary Programming is very similar to Evolution Strategies, although the two approaches developed independently.

Advantage and Disadvantages: Examples of problems where EA have been quite successful are: Timetabling and Job-Shop Scheduling Problem (JSSP), finding the most beneficial locations for offices, etc., and typical Operational Research (OR) problems with many constraints.

GA has proven to be well suited to optimisation of specific non-linear multivariable systems. GA is used in a variety of applications including scheduling, resource allocation, training ANNs, and selecting rules for fuzzy systems. *"GAs should be used when there is no other known problem solving strategy, and the problem domain is NP-complete. That is where GAs comes into play, heuristically finding solutions where all else fails." It is generally agreed that* EAs are especially ill suited for problems where efficient ways of solving them are already known.

We may conclude that the EA tries to mimic the process of biological evolution, complete with natural selection and survival of the fittest. The four main paradigms are Genetic Algorithm (GA), Genetic Programming (GP), Evolutionary Programming, and Evolution Strategy. EA is a useful method of optimisation when other techniques are not possible. EAs seem to offer an economic combination of simplicity and flexibility, and may be the better method for finding quick solutions than the more expensive and time consuming (but higher quality) OR methods. However, hybrid system between OR and EA should be able to perform quite well.

It is expected that if a backward Evolutionary Algorithm is used on an accepted OR solution, maybe then the human eye could easily rearrange the first string in a more effective way. If EA then were to run the string through the normal forward process, the end result could be better than using EA on an unperfected start string.

Hybrid System: More people have recently begun to consider combining the approaches into hybrid ones. Hybrid System is the system *that uses more than one problem-solving technique in order to solve a problem".* There is a huge amount of interest in Hybrid Systems, for example: neural-fuzzy, neural-genetic, and fuzzy-genetic hybrid systems. Researchers believe they can capture the best of the methods involved, and outperform the solitary methods.

"Fuzzy Logic and Fuzzy Expert System" and "Data Mining" are deliberately placed under the heading of Hybrid System. Fuzzy Logic is a method that is combined with other AI techniques (Hybrid System) to represent knowledge and reality in a better way. Data Mining does not have to be a Hybrid System, but usually is, for example, IBM's DB2 (Data Mining tool), which contains techniques (IBM, 2001) such as Statistics, ANN, GA, and Model quality graphics, etc. Let us now take a closer look at the methods.

Fuzzy Logic and Fuzzy Expert Systems Fuzzy Logic resembles human reasoning, but uses estimated information and vagueness in a better way. The answers to real-world problems are rarely black or white, true or false, or start or stop. By using Fuzzy Logic, knowledge can be expressed in a more natural way (fuzzy logic instead of Boolean "Crisp" logic).

i) Fuzzy Logic is *a departure from classical two-valued sets and logic, that uses "soft" linguistic (e.g,. large, hot, tall) system variables and a continuous range of truth values in the interval [0,1], rather than strict binary (True or False) decisions and assignments."*

Fuzzy Logic is ideal for controlling non-linear systems and for modeling complex systems where an inexact model exists, or in systems where ambiguity or vagueness is common. There are many commercial products are available today which uses Fuzzy logic like washing machines, high speed train etc.

ii) Fuzzy Expert Systems: Often Fuzzy Logic is combined with Expert Systems, such as the so-called Fuzzy Expert Systems which are the most common use of Fuzzy logic. These systems are also called "Fuzzy Systems" and use Fuzzy Logic instead of Boolean (crisp) logic. Fuzzy Expert Systems are used in several wide-ranging fields, including: Linear and Nonlinear Control Pattern Recognition, Financial Systems, Operation Research, Data Analysis, Pattern recognition etc.

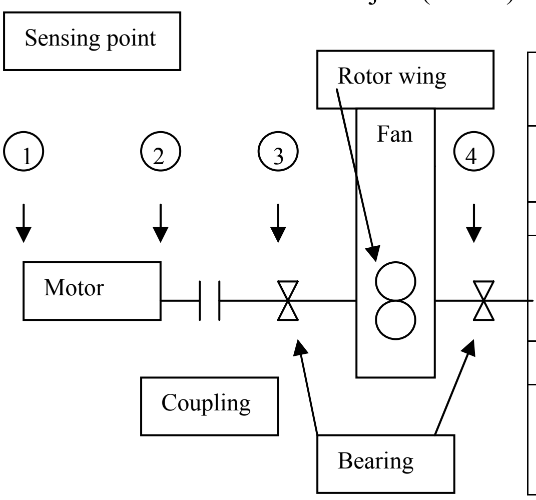
We may conclude that a Hybrid system uses more than one technique, such as neural-fuzzy, neural-genetic, Fuzzy Expert System, Data Mining (most often), etc., to solve a problem. Fuzzy logic is incorporated into computer systems so that they represent reality better by using "non-crisp" knowledge. Often Fuzzy Logic is combined with Expert Systems, the so-called Fuzzy Expert System or more simply, "Fuzzy System."

Data Mining software most often uses various techniques, including Neural Networks, statistical and visualization techniques, etc. to turn what are often mountains of data into useful information. Data Mining does not always contain AI techniques. It is expected that it is quite possible that Data Mining will become a very useful tool for companies in the competition for market shares.

More examples of commercial use of Artificial Intelligence:

Expert Systems For Equipment Failure Diagnosis:

Many expert systems for diagnosis have been developed in maintenance management. An example of expert system for diagnosing ventilators is described below. *Figure 4* shows the object (air fan) to be diagnosed and its possible areas and causes of failure.



Portion		Failure
Fan	Rotor wing	Unbalance looseness of bolt, etc.
	Rotor axis	Bending, resonance, etc.
Transmission	Coupling	Misalignment, looseness of bolt, etc.
Motor	Rotor	Unbalance bending of axis, etc.
	Stator	Unbalance of winding, etc.
	Cooling fan	Unbalance, etc.
Bearing		Bad lubrication, crack, wear, etc.
Base	Frame	Resonance, lack of silliness, etc.
	Bolt	Looseness, breaking, etc.
	Base	Lack of silliness, etc.

Figure 4: Failure analysis of an air fan

Rule 2 :	If the velocities at measuring points 2 and 3 are abnormal, then the transmission failure is expected.

Figure 5: Production rules based on Experts' experience

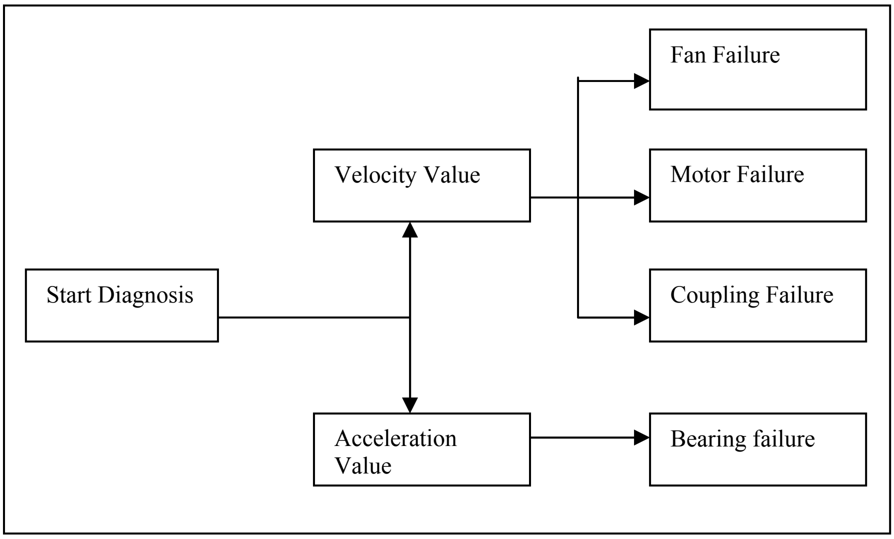


Figure 6: Inference process

The acceleration and velocity of vibration at the sensing points 1, 2, 3, and 4 are measured. The causalities between these measured values and failures are obtained by using expert knowledge. This knowledge is expressed in a matrix and is transformed into production rules are in *Figure 5*. The precise diagnosis is carried out based on the spectral analysis of the vibration data. The levels of the fundamental and higher components of the data are calculated. The relationship between the level values and failures is obtained by using expert knowledge. This knowledge is represented by frames. By using this knowledge source, the process of inference process as shown in *Figure 6*.

Predictive Maintenance in Place of Preventive Maintenance

With the help of AI the importance of predictive maintenance has increased although time based preventive maintenance has been used as a basic method. Predictive maintenance based on condition of the equipment that is for example, if we replace a bearing when the vibration exceeds a certain limit rather than being guided by replacing the bearing at a fixed interval. With use of predictive maintenance the extra time spent in breakdown maintenance can be avoided. Lastly, when the deterioration is slow, the predictive maintenance provides substantive time and cost advantages over the preventive maintenance performed at a set time interval. Thus, as demonstrated, the advantages of predictive maintenance include:

- replacement period prolongation
- safety improvement
- accident prevention
- reliability improvement

Diagnostic techniques based on machine condition are used to detect degradation of any equipment. In Japan, these techniques have been known since the 1960s, particularly in the steel manufacturing industry. Here are some examples.

Machinery and equipment

- Fluid machines
- Electric rotation machines
- Mills
- Stationary electric machines
- Motors

- Blowers
- Pumps
- Towers
- Drums

Sensing place

- Bearing portions
- Tanks
- Shafts
- Pipes

Condition-based diagnosis techniques have also been used to identify the mode of failure in abnormal vibration, crack by nondestructive examination (ultrasonic or X-ray), corrosion, or degradation of insulation. A very popular technique is to detect the abnormal vibration in the bearing portions and the shaft of rotating machinery. The level of vibration in the machine axis is measured by using the acceleration pick-up at regular intervals, thus obtaining the tendency of increasing vibration. Many rotating machines are maintained by using this method. The precondition for a condition-based strategy is to make the deteriorating conditions more transparent and predictable. This is where Artificial Intelligence can be used to bring competitive advantages.

Customer Relationship Management "Behaviour Analysis"

Behaviour Analysis and prediction of possible behaviour by the customer and then accordingly planning the business activity can definitely boost the business and profitability for business activities like retail business at a departmental store, credit card issuance and collections of dues, insurance policies coverage and mortgage etc. Such analysis is successfully being carried out by using AI techniques. The benefit of these new systems is that they reduce the amount of time necessary to approve a loan by using the computer to take decisions based on the variables values. Without human influence in the decision-making process, it becomes a very clean decision without emotion or preconceived ideas. Whether to apply for or extend a loan is often a critical decision for a company or an individual. With this new fast approval are companies not making it too easy to make loans? Perhaps the time needed before AI came on the scene gave the borrower time to think it though carefully. However, the methods exist and are in use at this moment to make decisions. Evidently AI has penetrated the business of Credit Card Issuers, Collectors, Insurance and Mortgage.

Customer Relationship Management "Support & Marketing"

The Office Assistant in Microsoft's Office packages uses AI and has a broad installed base today, with more than 90 percent of the Windows and Macintosh market, at the very least, this proves that support software containing AI has already penetrated the market. Advisory Expert Systems have been on the market for a long time.
At HP the interactive advice system CAST/BW, provides quick, accurate hardware sizing, network configuration, and usage recommendations. The system turns expert knowledge from SAP, HP internal competency centres, the HP Enterprise Server Group, and existing SAP. The Expert System functions in the same way as working directly with HP. Business Warehouse implementations into an easy-to-use advisory tool, use of robots, and marketing agents, support the assumption that support system based on AI have already entered the business market and are frequently used.

Company Control

There are several AI-based programs that control what employees do on the Internet, and what they send and receive in their e-mail at work. It is also believed that while preventing access to inappropriate web sites could be acceptable, checking employees' e-mail is going one step too far. Unless a reasonable limit is set, we will have a "Big

Brother" society. Furthermore, with all of the electronic information that companies receive today, it is expected that intelligent agents will be used more and more often to process information in automated and customized ways to ease information overload.

Production Management

AI software that learned to 'breed' factory schedules generates far better schedules than those that humans can produce with the help of Genetic Algorithms. With the case studies it has been proved that Data Mining with ANN, help solve some of the processing and interpretation problems for companies and have even played a key role in discovering oil fields.

Finance Management

Some believe that computers with Neural Networks are better at selecting stocks than people are. However, finding information regarding Neural Networks' success in the field of finance is difficult, most likely because successful systems are being treated as company secrets. The discussion of AI in the financial context has generally indicated that AI techniques are somewhat useful to most financial applications. AI techniques should catch on in coming years given the growing complexity of the markets, which will require more computing power and analysis to deal with information overload. It seems that many systems are best used as assistants to an existing team of experts rather than on their own.

We may conclude that AI has gained a foothold in the world of business. That foothold, moreover, is getting larger and larger as time goes by. One question which comes to mind is then why has it taken so long before these methods are visible in business applications. There appear to be four possible answers to that question. First, it seems that the development of processing power has been a catalyst that made it possible for AI-based system to gain a foothold in the business world. Furthermore, it is just lately that affordable computers with sufficient processing power have become available to companies. Second, AI often competes with business methods that have been quite successful and in use for very long periods of time. So, why risk changing a working concept, companies may think. There are also some interpretation difficulties in some AI systems for instance, old tried and true statistical methods win over ANN simply because people are unwilling to use a system where they do not see the effect of each variable (i.e., the Black Box). This can be a high threshold to overcome. Third, many AI applications involve large investments of money and failure can also be very costly; this makes the companies circumspect regarding investment decisions. Finally the fourth reason is simply that new technologies seems always to have a threshold for acceptance. Furthermore, many critics believe that AI has not fulfilled its promise. Yet they do not discard it as a method. It is a fact that companies are using AI and earning money as a result.

3.5 BUSINESS ANALYTICS

Business analytics is a term used for sophisticated forms of business data analysis. Analytics closely resembles statistical analysis and data mining, but tends to be based on physics modeling involving extensive computation.

Example: A common application of business analytics is portfolio analysis. Let us take a case of a bank or lending agency which has a collection of accounts, some from wealthy people, some from middle class people, and some from poor people. The question is how to evaluate the whole portfolio.

The bank can make money by lending to wealthy people, but there are only few wealthy people. The bank can make more money by also lending to middle class people. The bank can make even more money by lending to poor people.

Note that poorer people are usually at greater risk of default. Note too, that some poor people are excellent borrowers. Note too, that a few poor people may eventually become rich, and will reward the bank for loyalty.

The bank wants to maximize its income, while minimizing its risk, which makes the portfolio hard to understand.

The analytics solution may combine time series analysis, with many other issues in order to make decisions on when to lend money to these different borrower segments, or decisions on the interest rate charged to members of a portfolio segment to cover any losses among members in that segment.

Business analytics as Change Manager: The best hedge against an uncertain future is figuring out how to avoid being surprised when the unexpected happens. Better yet, business executives need to be able to quickly take advantage of changing conditions with new products and services. To accomplish these somewhat elusive goals, companies must constantly improve their ability to identify, classify, and intelligently analyse all available information.

A company's enterprise-information assets — particularly customer data — can be vast, but all too often they're squirreled away in application silos. The marketing department has customer demographics; the accounting department oversees purchase histories, payment frequency, and contract terms; and the customer-service department maintains problem reports.

Web sites are adding to the mounds of customer data that companies have to deal with. Web managers can monitor click stream log files to identify how customers navigate a site, where they came from, how long they were there, what they purchased, and where they headed afterward.

The goal of high-end business analytics is to turn these individually useful but often marginalized data resources into something that lets business managers immediately grasp the dynamic state of their business. This includes the current and projected status of their customers by group and individual needs. Ideally, analytics lets companies combine demographic and behavioural data with sales information to determine how best to leverage the customer relationship.

A company's ultimate goal is to precisely target new and existing goods to those individuals and groups based on the profiles gleaned from the analytic process. Corporate decision makers need to be increasingly attuned to business opportunities that arise whenever a customer, business, or industry factor changes. Exploiting change is the role of business analytics.

Most companies have Web-log data that's sparse and discrete and a wealth of transaction data, in some cases going back 20 years or more, that's rich and continuous. The nirvana here, is to integrate these data sources in a meaningful way so a company can tell what its customers are doing now and have done in the past. Business analysts can take that data, do a little trend analysis, and decide how best to pitch new products to customers.

There are costs associated with integrating all this data. The investment in gathering the data and aggregating it in meaningful ways must yield a quantifiable business benefit. You can gather all kinds of information, but if you don't have context, if you don't advance a business hypothesis and generate a good strategy, it's pretty much worthless information.

Reviewing historical and current data over time can optimally yield enough trend information to feed statistical models that let trained users predict events and trends. However, there's a reticence on the part of decision makers to trust "black box" business models used by consultants and in some software tools without understanding the parameters being measured.

Most of the data is extremely diverse and often in a constant state of flux, so there's usually no single, specific analytic technique appropriate to your data at a particular stage of its evolution. The upshot is that predictive models must be appropriate to the task, highly customized to specific business conditions, and targeted to address specific areas of interest or answer particular questions.

Rather than just having high-end modeling at one end of the spectrum and static reports at the other, what's needed is analytics and analytic applications that watch for change and initiate actions at both an individual and a group level. Analytics are most useful when the application proactively lets the right people know when relevant business factors change.

One way of spotting trends is to be able to measure just the part of the business that's changing. The future level of a lake can be predicted based on how much water is going in and how much is going out. The same analogy applies to business customers.

It has been observed that half of companies perform daily data warehouse updates, 40% have weekly or monthly updates, and 10% have real-time or near-real-time updates. It has also been observed that many of the companies performing weekly or monthly updates are apt to shift *en masse* to performing daily or continuous updates as a result of evolving market and competitive conditions.

The need to act upon information is a key driver of high-end analytic applications. Folding business intelligence back into the business decision-making process, operational systems, or human interaction is the primary way to make sure that a company can respond appropriately to changes in customer and market conditions. To bring about this organisational dynamic, the analytic results must be available to all of the people within a company. Traditionally, a lot of information gleaned from a company's business-intelligence tools went to upper management, but it didn't percolate quickly down into the trenches where it could be acted upon by the rank and file. However, the percolated information needs to be based on customization for the company, as company may not like to send all information to every employee.

Business analytics is moving beyond data warehousing, which a limited number of experts usually use, to include other components, such as publish-and-subscribe technology to distribute market intelligence to the various employees who need it. If certain events happen, the affected parties are notified in a timely fashion. This represents a kind of opting-in capability for specific kinds of information that helps mid-and low-level decision makers more quickly get the data they need to take action.

Improved search and text-mining techniques are aiding the quest for timely information. Predictive modeling applies in this scenario as well. This form of business modeling can help present information based on particular users' past interests and help predict what a manager might want or need to know in the future.

It's all well and good to have a group of statisticians sitting in their ivory cubicles, and it's quite true that companies still need those people to do the data mining today. But if business intelligence is to be more widely used across the enterprise, people must be able to act upon it in a timely fashion and fold the information back into the business process. Critical information about the state of the business must be distributed quickly, efficiently, and appropriately to those people and departments that can affect the company's adaptability.

These are goals that IT departments have avidly pursued but have hitherto never been able to grasp fully. Fortunately, today's advanced analytics tools point to a time when compiling data, monitoring near-real-time business events, and synthesizing that data via data-mining and other advanced techniques will let companies respond almost immediately to perceived or predicted changes in market conditions. Early versions of these tools already let companies make business forecasts, optimize resources on the fly, and suggest appropriate actions with unprecedented speed, agility, and accuracy.

Companies should look twice at implementing traditional business-intelligence solutions and look more toward solutions that deliver analytics at the point of a business process.

A classic example of this is seen in inventory reordering systems based on supply-and-demand forecasts. Market data is fed back into the system to determine where, when, and how much inventory should be reordered. This type of analysis results directly in a modification of the business processes. The trick is to incorporate this intelligence into both tactical and strategic decision-making with managers making real-time decisions.

The latest challenge in business analytics is to capture external data from sources that companies haven't really considered before. If there's a cliché in the making here, it's that data abounds, but knowledge acquisition takes a lot more work. Many alternate sources of data are available via the Web. The number of customer-data sources continues to expand dramatically. The key will be to determine which of these data points are more relevant and to figure out organisational processes that will permit appropriate data to be fed to the analytics engine so a company or department can respond to it in real time and feed it into ongoing projects, sales efforts, and marketing campaigns.

Neural networks are flexible models that can be applied to predictive analysis and pattern-recognition problems. You want to control for different factors and see what's working for you and what's giving you the most bang for your buck. Well-targeted analytics will provide yield indicators and trends that the company can exploit to its advantage.

Another trend that we're seeing is a kind of cross-disciplinary awareness. Companies that have statisticians with different bases of experience or analysts who are able to make analogies more easily than most of us have recognised that there are large data issues in fields such as genomics. Both genetic researchers and companies with terabyte-level customer-relationship management systems share some common data management issues. Each group could learn from the other and share common analytical approaches.

Another way business-intelligence tools are evolving is in interactive analytics, in which users are able to slice and dice data and also carry out what-if scenarios. Instead of driving the enterprise by looking in the rearview mirror, you're looking forward to what might happen and can strategize on how to reach that outcome. Interactive analytics is an area where many conventional business-analytical tools fall short. Organisations want a single view of the customer, particularly given current economic trends. This requires a move away from point solutions to more integrated systems. It's a giant problem to access all of the disparate data sources scattered around the organisation. The reason it's a giant problem is that many companies wouldn't even know what to do with it once it's in one place.

This was characteristic of the naiveté of early data warehouse projects in the 1990s—many of which failed. "We're seeing much more sophistication around the way high-end business analytics are approached today, We don't really just want to bring a lot of data together; we actually want to work backward from the questions we're trying to answer."

There's also the issue of corporate management developing a level of trust in advanced analytical tools. Being comfortable with driving their business based on associations that aren't easily visible to the human eye doesn't come easily to many CEOs and business managers. As well, many VPs and marketing managers approach marketing as more of an art than a science and are somewhat resistant to analytic technologies.

The acceptance problem is twofold. The tools and techniques are still complex and difficult to use. Companies require the guys with the lab coats to make these tools hum. The analytic results that derive from them are often barely auditable, especially when employing things such as neural networks. The sheer sophistication of the tools makes it difficult for business managers to understand how the software came to a particular conclusion. As a result, decision makers often feel uncomfortable implementing results from analysis that they can't audit, figure out what the assumptions are, and how the results were derived.

Trust will emerge when people take a couple of these recommendations, implement them, and see a positive impact on the bottom line. The ultimate outcome of high-end analytics will be systems that can process diverse business data, draw conclusions, and alert managers to proposed actions and outcomes.

Hopefully, the impact on business will be companies that are more agile and better informed about all the conditions both within and outside their corporate boundaries.

Available Business Analytics: Such suits are being offered by several vendors. Vendors claim that these suits identify trends, perform comparisons and highlight opportunities in various business functions like supply chain management, even when large amounts of data are involved. These suits combine technology with human effort and help decision-makers in business areas such as sourcing, inventory management, manufacturing, quality, sales and logistics. Business Analytics solutions leverage investments made in enterprise applications, web technologies, data warehouses and information obtained from external sources to locate patterns among transactional, demographic and behavioural data.

Vendors claim that with wafer-thin margins, managing costs is an ongoing challenge. Business analytics solutions being offered can help managers in sales, marketing, customer support, supply chain planning and financials understand and respond to key issues, such as:

- Correctly analysing barriers to market-entry, this varies widely with each product,
- Responding to competition within a well defined supply tier structure,
- Dealing with the high threat of product substitutes,
- Continually driving product innovation,
- Managing product lifecycles to maximize returns.

Business analytics solutions available have capabilities for:

Executive Information Systems (EIS): Executive dashboards with drilldown analysis capabilities that support decision-making at an executive level.

Online Analytical Processing (OLAP): OLAP tools are mainly used by analysts. They apply relatively simple techniques such as deduction, induction, and pattern recognition to data in order to derive new information and insights.

Standard reports are designed and built centrally and then published for general use.

There are three types of standard reports:

- *Static reports or canned reports:* Fixed-format reports that can be generated on demand.

- *Parameterized reports:* Fixed layout reports that allow users to specify which data are to be included, such as date ranges and geographic regions.

- *Interactive reports:* These reports give users the flexibility to manipulate the structure, layout and content of a generic report via buttons, drop-down menus and other interactive devices.

Ad-hoc reports: generated by users as a "one-off" exercise. The only limitations are the capabilities of the reporting tool and the available data.

Advanced Analytics: Advanced statistical and analytical processing such as correlations, regressions, sensitivity analysis and hypothesis testing.

Empowers everyone: Provide each person with relevant, complete information tailored to their role.

- **Drive more effective actions:** Guide users toward more intelligent actions and customer interactions.

- **Do it in real time:** Use real-time intelligence to drive better business outcomes and operational results every second of every day.

Comprehensive Pre-built Analytic Applications

The Commercial Business Analytics available offer a comprehensive set of industry-specific analytic applications to optimize performance for sales, service, marketing, contact center, finance, supplier / supply chain, HR / workforce, and executive management. These pre-built analytic applications integrate and transform data from a range of enterprise sources-including Siebel, Oracle, PeopleSoft, SAP, and others-into actionable intelligence for each business function and user role. A few pre-built applications are described below:

- Sales Analytics
- Service and Contact Center Analytics
- Marketing Analytics
- Supply Chain Analytics
- Financial Analytics
- Workforce Analytics
- Real-Time Decisions Solutions

Stages of a Business Analytics

Figure 7 depicts the various stages in a data warehouse and business analytics initiative. While data analytics comprise the service layer for the applications, the other stages are equally important. Analytical services have varying applicability across the high tech value chain.

Examples of Pre-built Analytic Applications: As claimed by vendors, the Business Analytics platform provides the full range of enterprise business intelligence functionality-interactive dashboards; full ad hoc, proactive intelligence and alerts; advanced reporting; and predictive analytics all delivered on one common, modern Web architecture. Business intelligence (BI) tool enables the enterprise to get it SBI requirements such as common, shared metadata; heterogeneous data source access; and server-centric Web architectures, Business Analytics' make available robust BI platform which is mature and proven in these areas. Business Analytics platform provides the next level of enterprise BI functions.

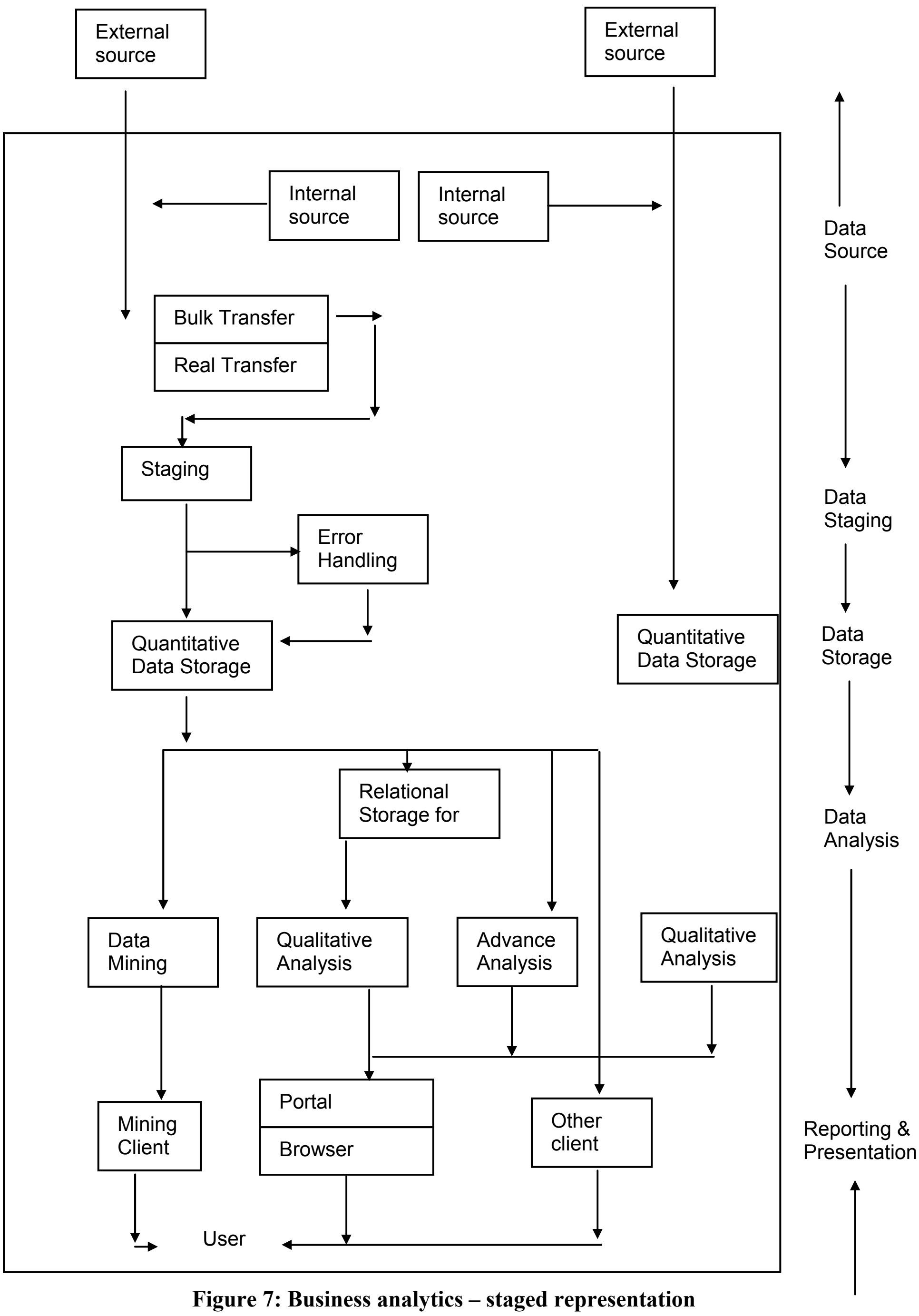


Figure 7: Business analytics – staged representation

Supply Chain Analytics

It enables more effective management of the complexities of the organisation's supply chain. A typical Supply Chain Analytics provides several dashboards, and several pre-built reports that deliver comprehensive insight across sales, logistics, procurement, manufacturing, and quality assurance departments. This helps to:

- Better manage customer commitments while optimising inventory and supplier spend,
- Gain up-to-the-minute insight to inventory, sourcing, and supplier performance.

The given examples of pre-built applications are from Sieable Business Analytics:

Supplier Sourcing Analytics

- Gain detailed visibility into direct and indirect spend,
- View product delivery schedules and payments,
- Identify opportunities to consolidate spend and reduce costs.

Supplier Performance Analytics

- Determine who are the best and worst performing suppliers,
- Monitor price, delivery, and product quality performance,
- Manage supply to minimize business disruption risks.

Inventory Analytics

- Gain visibility into inventory activities to minimize unnecessary expenditures,
- Optimize inventory levels to conserve working capital,
- Ensure customer satisfaction through better product availability.

Enterprise Sales Analytics

Enterprise Sales Analytics provides several key performance indicators and large number of reports delivered in several customizable dashboards. A typical Enterprise Sales Analytics enables sales managers and front-line representatives to dramatically improve sales effectiveness by:

- Providing real-time, actionable insight into every sales opportunity at the point of customer contact,
- Closing business faster and increasing overall sales revenue,
- Confidently providing more accurate and up-to-date sales forecasts,
- Quickly pinpointing problems and opportunities to close more business,
- Sales Analytics,
- Monitor status and take actions to ensure quota achievement,
- Maximize revenue through better cross-selling and up-selling,
- Shorten sales cycles and increase win rates.

Sales Revenue Analytics

Track sales orders, invoicing, and revenue. Increase customer value and follow-on sales potential. Proactively manage order pipeline and focus resources to maximize sales revenue.

Sales Revenue and Fulfilment Analytics

- Ensure faster customer order fulfilment and revenue recognition,
- Increase customer satisfaction and manage expectations,
- Improve product delivery cycle times,
- Achieve more effective backlog management and sales revenue attainment.

Sales Revenue and Pipeline Analytics

- Accelerate lead to cash cycle through visibility across entire sales process,
- Achieve comprehensive view of customer orders and invoices,
- Maximize sales throughput.

Financial Analytics

This enables understanding and managing the key drivers of shareholder value and profitability. A typical Financial Analytics helps front-line managers improve financial performance through complete, up-to-the-minute information on their department's expenses and revenue contribution. Users will benefit from:

- Up-to-the-minute information enabling financial managers to take actions that improve cash flow,
- Lower costs and increased profitability,
- More accurate, timely, and transparent financial reporting,
- Financial Analytics features large nuber of best practice-based key performance indicators and several reports.

Payables Analysis

- Assess cash management effectiveness,
- Ensure that strategic suppliers receive timely payments,
- Monitor operational effectiveness of the payables department in ensuring lowest transaction costs.

Receivables Analysis

- Effective working capital management by monitoring DSOs and cash cycles,
- Identify past due accounts and manage collections,
- Manage and control receivables risk.

General Ledger Analysis

- Perform faster end-of-period closing,
- Manage financial performance across locations, customers, products, and territories,
- Receive real-time alerts on material events that may impact financial condition.

Profitability Analysis

- Identify your most profitable customers, products, and channels,
- Understand profitability drivers across regions, divisions, and profit centres,
- Gain visibility into cost drivers and take actions to improve profitability.

Marketing Analytics

This enables maximum results from marketing investments. A typical analytic provides the entire marketing organisation with a complete, up-to-the-minute picture of customer preferences, buying behavior, and profitability. Marketing Analytics helps to:

- Develop closer, more valuable customer and prospect relationships,
- Improve marketing effectiveness,
- Maximize the return on marketing investment.

Marketing Planning Analytics

- Achieve better campaign response rates,
- Profile customers for more effective event-based promotions,
- Allocate resources more effectively by identifying what drives campaign results.

Campaign Performance Analytics

- Track and measure campaign effectiveness in real time,
- Understand factors that drive campaign results and lead conversion rates,
- Compare individual campaign results to target metrics.

Customer Insight Analytics

- Understand product affinity for targeted promotions,
- Profile customers, buying behaviour for more effective promotions,
- Gain better insight into segmentation characteristics,
- Understand which offers have the greatest impact on customer behaviour.

3.6 BUSINESS INTELLIGENCE

The term **business intelligence** (**BI**) typically refers to a set of business processes for collecting and analyzing business information. This includes the technology used in these processes, and the information obtained from these processes.

BI business processes

Organisations typically gather information in order to assess the business environment, and cover fields such as marketing, research, industry or market research, and competitor analysis. Competitive organisations accumulate business intelligence in order to gain sustainable competitive advantage, and may regard such intelligence as a valuable core competence in some instances.

Generally, BI-collectors glean their primary information from internal business sources. Such sources help decision-makers understand how well they have performed. Secondary sources of information include customer needs, customer decision-making processes, the competition and competitive pressures, conditions in relevant industries, and general economic, technological, and cultural trends. Industrial espionage may also provide business intelligence by using covert techniques. A gray area exists between “normal” business intelligence and industrial espionage.

Each business intelligence system has a specific goal, which derives from an organisational goal or from a vision statement. Both short-term goals (such as quarterly numbers to share market) and long term goals (such as shareholder value, target industry share / size, etc.) exist.

BI technology

Some observers regard BI as the process of enhancing data into information and then into knowledge. Persons involved in business intelligence processes may use application software and other technologies to gather, store, analyze, and provide access to data, and present that data in a simple, useful manner. The software aids in Business performance management, and aims to help people make "better" business decisions by making accurate, current, and relevant information available to them when they need it.

Some people use the term "BI" interchangeably with "briefing books" or with "executive information systems", and the information that they contain. In this sense, one can regard a business intelligence system as a decision-support system (DSS).

BI software types

People working in business intelligence have developed tools that ease the work, especially when the intelligence task involves gathering and analyzing large quantities of unstructured data. Each vendor typically defines Business Intelligence his/her own way, and markets tools to do BI the way that they see it.

Business intelligence includes tools in various categories, including the following:

- AQL - Associative Query Logic
- Scorecarding
- Business Performance Management and Performance Measurement
- Business Planning
- Business Process Re-engineering
- Competitive Analysis
- Customer Relationship Management (CRM) and Marketing
- Data mining (DM), Data Farming, and Data warehouses
- Decision Support Systems (DSS) and Forecasting
- Document warehouses and Document Management
- Enterprise Management systems
- Executive Information Systems (EIS)
- Finance and Budgeting
- Human Resources
- Knowledge Management
- Mapping, Information visualization, and Dashboarding
- Management Information Systems (MIS)
- Geographic Information Systems (GIS)
- Online Analytical Processing (OLAP) and multidimensional analysis; sometimes simply called Analytics (based on the so-called hypercube or cube)
- Statistics and Technical Data Analysis
- Supply Chain Management/Demand Chain Management
- Systems intelligence
- Trend Analysis
- User/End-user Query and Reporting
- Web Personalization and Web Mining
- Text mining.

History

Prior to the start of the Information Age in the late 20th century, businesses sometimes struggled to collect data from non-automated sources. Businesses then lacked the computing resources to properly analyze the data, and often made business decisions primarily on the basis of intuition.

As businesses started automating more and more systems, more and more data became available. However, collection remained a challenge due to a lack of infrastructure for data exchange or to incompatibilities between systems. Analysis of the data that was gathered and reports on the data sometimes took months to generate. Such reports allowed informed long-term strategic decision-making. However, short-term tactical decision-making continued to rely on intuition.

In modern businesses, increasing standards, automation, and technologies have led to vast amounts of data becoming available. Data warehouse technologies have set up repositories to store this data. Improved Extract, transform, load (ETL) and even recently Enterprise Application Integration tools have increased the speedy collecting of data. OLAP reporting technologies have allowed faster generation of new reports which analyze the data. Business intelligence has now become the art of sieving through large amounts of data, extracting pertinent information, and turning that information into knowledge upon which actions can be taken.

Business intelligence software incorporates the ability to data mine, analyze, and report. Some modern BI software allow users to cross-analyze and perform deep data research rapidly for better analysis of sales or performance on an individual, department, or company level. In modern applications of business intelligence software, managers are able to quickly compile reports from data for forecasting, analysis, and business decision making.

Indicators

BI often uses *Key performance indicators* (KPIs) to assess the present state of business and to prescribe a course of action. More and more organisations have started to make more data available more promptly. In the past, data only became available after a month or two, which did not help managers to adjust activities in time to hit Share Market targets. Recently, banks have tried to make data available at shorter intervals and have reduced delays.

The KPI methodology was further expanded with the Chief Performance Officer methodology which incorporated KPIs and root cause analysis into a single methodology.

KPI example

For example, for businesses which have higher operational/credit risk loading (for example, credit cards and "wealth management"), a large multi-national bank makes KPI-related data available weekly, and sometimes offers a daily analysis of numbers. This means data usually becomes available within 24 hours, necessitating automation and the use of IT systems.

Designing and implementing a business intelligence programme

When implementing a BI programme one might like to pose a number of questions and take a number of resultant decisions, such as:

- **Goal Alignment queries:** The first step determines the short and medium-term purposes of the programme. What strategic goal(s) of the organisation will the programme address? What organisational mission/vision does it relate to? A crafted hypothesis needs to detail how this initiative will eventually improve results / performance (i.e., a strategy map).

- **Baseline queries:** Current information-gathering competency needs assessing. Does the organisation have the capability of monitoring important sources of information? What data does the organisation collect and how does it store that data? What are the statistical parameters of this data, e.g., how much random variation does it contain? Does the organisation measure this?

- **Cost and risk queries:** The financial consequences of a new BI initiative should be estimated. It is necessary to assess the cost of the present operations and the increase in costs associated with the BI initiative. What is the risk that the initiative will fail? This risk assessment should be converted into a financial metric and included in the planning?
- **Customer and Stakeholder queries:** Determine who will benefit from the initiative and who will pay. Who has a stake in the current procedure? What kinds of customers/stakeholders will benefit directly from this initiative? Who will benefit indirectly? What are the quantitative / qualitative benefits? Is the specified initiative the best way to increase satisfaction for all kinds of customers, or is there a better way? How will customers' benefits be monitored? What about employees? shareholders? and distribution channel members?

- **Metrics-related queries:** These information requirements must be operationaged zed into clearly defined metrics. One must decide what metrics to use for each piece of information being gathered. Are these the best metrics? How do we know that? How many metrics need to be tracked? If this is a large number (it usually is), what kind of system can be used to track them? Are the metrics standardized, so they can be benchmarked against performance in other organisations? What are the industry standard metrics available?

- **Measurement Methodology-related queries:** One should establish a methodology or a procedure to determine the best (or acceptable) way of measuring the required metrics. What methods will be used, and how frequently will the organisation collect data? Do industry standards exist for this? Is this the best way to do the measurements? How do we know that?

- **Results-related queries:** Someone should monitor the BI programme to ensure that objectives are being met. Adjustments in the programme may be necessary. The programme should be tested for accuracy, reliability, and validity. How can one demonstrate that the BI initiative (rather than other factors) contributed to a change in results? How much of the change was probably random?.

3.7 ROLE OF BUSINESS INTELLIGENCE

The information economy puts a premium on high quality actionable information — exactly what *Business Intelligence (BI)* tools like data warehousing, data mining, and OLAP can provide to the business. A close look at the different organisational functions suggests that BI can play a crucial role in almost every function. It can give new and often surprising insights about customer behavior; thereby helping the businesses meeting their ever-changing needs and desires. On the supply side, BI can help businesses to identify their best vendors and determine what separates them from not so good vendors. It can give businesses better understanding of inventory and its movement and also help improve production and storefront operations through better category management. Through a host of analyses and reports, BI can also improve internal organisational support functions like finance and human resource management of any business.

Business Intelligence is applicable to all types of businesses; however, the magnitude of gains may vary. Here we will discuss in detail how BI can improve the key functional areas and thereby the overall productivity of the business.

3.7.1 Marketing

Smart Businesses in their efforts to meet the competition have reoriented their *business around the customer* by improving *Customer Relationship Management.* In the mad rush to acquire new customers, they have realized it is equally important to retain the existing ones. Increased interaction and sophisticated analysis techniques have given businesses unprecedented access to the mind of the customer; and they are using this to develop one-to-one relation with the customer, design marketing and promotion campaigns, optimize sale front layout, and manage e-commerce operations. For improving Customer Relationship Management (CRM), the CRM strategy needs to include:

- *Operational CRM:* Automating interaction with the customers and sales force,
- *Analytical CRM:* Sophisticated analysis of the customer data generated by operational CRM and other sources like Sales Orders transactions, web site transactions, and third-party data providers.

A typical business organisation has a huge customer base and often customer's needs are fairly varying. Without the means to analyze voluminous customer data, CRM strategy is bound to be a failure, therefore, the Analytical CRM forms the core of the customer relationship strategy of a business.

Marketing and sales functions are the primary beneficiaries of Analytical CRM and the main touch points from where the insights gained about the customer is absorbed in the organisation.

Analytical CRM uses key business intelligence tools like data warehousing, data mining, and OLAP to present a unified view of the customer. Following are some of the uses of Analytical CRM:

- *Customer Classification*: Customer classification is a vital ingredient in a business organisation's marketing strategy. It can offer insights into how different segments respond to shifts in demographics, fashions and trends. For example it can help classify customers in the following segments:

  a) Customers who respond to new promotions
  b) Customers who respond to new product launches
  c) Customers who respond to discounts
  d) Customers who show a tendency to purchase specific products.

- *Campaign / Marketing Promotion Effectiveness Analysis*: Once a campaign is launched, its effectiveness can be studied across different media and in terms of costs and benefits; this greatly helps in understanding what goes into a successful marketing campaign. Campaign/ promotion effectiveness analysis can answer questions such as:

  a) Which media channels have been most successful in the past for various campaigns?
  b) Which geographic locations responded well to a particular campaign?
  c) What were the relative costs and benefits of this campaign?
  d) Which customer segments responded to the campaign?

- *Customer Lifetime Value*: Not all customers are equally profitable. At the same time customers who are not very profitable today may have the potential of being profitable in future. Hence, it is absolutely essential to identify customers with high lifetime value; the idea is to establish long-term relations with these customers.
  The basic methodology used to calculate customer lifetime value is to deduct the cost of servicing a customer from the expected future revenue generated by the customer, add to this the net value of new customers referred by this customer, and discount the result for the duration of the relationship. Though this sounds easy, there are a number of subjective variables like overall duration of the

customer's relation with the business, gap between intermediate cash flows, and discount rate. It is suggested that data mining tools should be used to develop customized models for calculating customer lifetime value.

1) *Customer Loyalty Analysis*: It is more economical to retain an existing customer than to acquire a new one. To develop effective customer retention programs it is vital to analyze the reasons for customer attrition. Business Intelligence helps in understanding customer attrition with respect to various factors influencing a customer and at times one can drill down to individual transactions, which might have resulted in the change of loyalty.

2) *Cross Selling*: Businesses use the vast amount of customer information available with them to cross sell other products at the time of purchase. This effort is largely based on the tastes of a particular customer, which can be analyzed using BI tools based on previous purchases. Businesses can also 'up sell' - sell more profitable products - to the customer at the time of contact.

3) *Product Pricing*: Pricing is one of the most crucial marketing decisions taken by businesses. Often an increase in price of a product can result in lower sales and customer adoption of replacement products. Using data warehousing and data mining, businesses can develop sophisticated price models for different products, which can establish price - sales relationships for the product and how changes in prices affect the sales of other products.

4) *Target Marketing*: Businesses can optimize the overall marketing and promotion effort by targeting campaigns to specific customers or groups of customers. Target marketing can be based on a very simple analysis of the buying habits of the customer or the customer group; but increasingly data mining tools are being used to define specific customer segments that are likely to respond to particular types of campaigns.

3.7.2 Sales and Orders

The success of a business in the future would depend on how effectively it manages multiple delivery channels like the Internet, interactive TV, catalogs, etc. A single customer is likely to interact with the retailer along multiple channels over a period of time. This calls for an integrated strategy to serve the customer well, which requires smooth flow of information across channels. To ensure smooth flow of information customer data needs to be collected from different channels in one data warehouse. Customer relationship strategy can then be built around this customer-centric data warehouse. We have already discussed how Analytical CRM can provide analyses over the centralized data warehouse. In this section we will explore how data warehousing and data mining can improve the effectiveness of a channel.

- ***E-Business Analysis:*** The Internet has emerged as a powerful alternative channel for established sales methods. Increasing competition from businesses operating purely over the Internet has forced the businesses who had not adopted this route to quickly adopt this channel. Their success would largely depend on how they use the Net to complement their existing channels. Web logs and Information forms filled over the web are very rich sources of data that can provide insightful information about customer's browsing behavior, purchasing patterns, likes and dislikes, etc. Two main types of analysis done on the web site data are:

1) ***Web Log Analysis:*** This involves analyzing the basic traffic information over the e-commerce web site. This analysis is primarily required to optimize the operations over the Internet. It typically includes following analyses:

   - **Site Navigation:** An analysis of the typical route followed by the user while navigating the web site. It also includes an analysis of the most popular pages in the web site. This can significantly help in site optimization by making it more user- friendly.

   - **Referrer Analysis:** An analysis of the sites, which are very prolific in diverting traffic to the company's web site.

   - **Error Analysis:** An analysis of the errors encountered by the user while navigating the web site. This can help in solving the errors and making the browsing experience more pleasurable.

   - **Keyword Analysis:** An analysis of the most popular keywords used by various users in Internet search engines to reach the concerned business e-commerce web site.

2) ***Web Housing:*** This involves integration of web log data with data from other sources like the purchase order transactions, third party data vendors etc. Once the data is collected in a single customer centric data warehouse, often referred to as Web house, all the applications already described under CRM can be implemented. Often a business wants to design specific campaigns for users who purchase from the e-commerce web site. In this case, segmentation and profiling can be done specifically for the .e-customers to understand their needs and browsing behavior. It can also be used to personalize the content of the e-commerce web site for these users.

3) ***Channel Profitability:*** Data warehousing can help analyze channel profitability, and whether it makes sense for the business to continue building up expertise in the channel. The decision of continuing with a channel would also include a number of subjective factors like outlook of key enabling technologies for that channel.

4) ***Product Channel Affinity:*** Some product categories sell particularly well on certain channels. Data warehousing can help identify hidden product-channel affinities and help the business design better promotion and marketing campaigns.

3.7.3 Human Resource

Data warehousing can significantly help in aligning the HR strategy to the overall business strategy. It can present an integrated view of the workforce and help in designing retention schemes, improve productivity, and curtail costs. Some BI applications in HR are:

- **Human Resource Reports/ Analytics:** Reports and analysis can be generated to support an integrated view of the workforce. Various analyses include staff movement and performance, workforce attrition by business, workforce performance by business, compensation and attrition, and other customized analyses and reports. The HR data can be integrated with benchmark figures for the industry and various reports can be generated to measure performance vis-à-vis industry benchmarks.

- **Manpower Allocation:** This includes allocating manpower based on the demand projections. According to the seasonal variation in demand, temporary manpower can be hired to maintain service levels. The demand levels vary within one working day also, which can be used to allocate resources accordingly.

- **HR Portal:** Employers need to maintain accurate employee data, which can be viewed by the employees for information relating to compensation, benefits, retirement facilities, etc. Payroll data can be integrated with data from other human resource management applications in the HR data warehouse. This data can then be circulated within the organisation through the HR portal.

- **Training and Succession Planning:** Accurate data about the skill sets of the workforce can be maintained in the data warehouse. This can be used to design training programs and for effective succession planning.

3.7.4 Finance and Accounts

The role of financial reporting has undergone a paradigm shift during the last decade. It is no longer restricted to just financial statements required by the law; increasingly it is being used to help in strategic decision making. Also, many organisations have embraced a free information architecture, whereby financial information is openly available for internal use. Many analytics described till now use financial data. Many companies, across industries, have integrated financial data in their enterprise wide data warehouse or established separate Financial Data Warehouse (FDW). Following are some of the uses of BI in finance:

- **Budgetary Analysis:** Data warehousing facilitates analysis of budgeted versus actual expenditure for various cost heads like promotion campaigns, energy costs, salary, etc. OLAP tools can provide drill down facility whereby the reasons for cost overruns can be analyzed in more detail. It can also be used to allocate budgets for the coming financial period.

- **Fixed Asset Return Analysis:** This is used to analyse financial viability of the fixed assets owned or leased by the company. It would typically involve measures like profitability per sq. foot of the space, total lease cost vs. profitability, etc.

- **Financial Ratio Analysis:** Various financial ratios like debt-equity, liquidity ratios, etc. can be analyzed over a period of time. The ability to drill down and join inter-related reports and analyses provided by all major OLAP tool vendors can make ratio analysis much more perceptive.

- **Profitability Analysis:** This includes profitability of individual business, departments within the business, product categories, brands, and individual SKUs. A major component of profitability analysis is the costs incurred by departments and the cost of acquiring, storing and allocating shelf space to particular product categories, brands, or SKUs. It goes without saying that profitability analysis has an extremely universal appeal and would be required by other groups within the business organisation.

3.8 BUSINESS INTELLIGENCE TOOLS

Business intelligence tools are a type of Application software designed to help the business intelligence (BI) business processes. Specifically they are generally tools that aid in the analysis and presentation of data. While some business intelligence tools include ETL functionality, ETL tools are generally not considered business intelligence tools.

Types of business intelligence tools

- OLAP (including HOLAP, ROLAP and MOLAP)
- Reporting software (also called Pixel perfect reporting software)
- Data mining
- Business performance management (BPM)

Open Source Business Intelligence Products

- **Pentaho:** enterprise-class reporting, analysis, dashboard, data mining and workflow capabilities.
- **OpenI:** simple web application that does out-of-box OLAP reporting.
- **Greenplum Inc.:** first open source powered database server that can scale to support multi-terabyte data warehousing demands.
- **YALE (Yet Another Learning Environment):** free open source software for Business Intelligence, Knowledge Discovery, Data Mining, Machine Learning, etc.
- **BEE Project:** BI Suite of tools ideal for mid size companies that has 50GB or less of data. It has ETL and uses ROLAP and is under the GPL license.
- **MarvelIT:** open source Business Intelligence solution based on the Apache Jetspeed Enterprise Portal and the popular OpenReports reporting application.
- **SpagoBI:** complete suite for the development of Business Intelligence that covers data and metadata organisation, static reporting and dimensional analysis, hidden information discovering by means of data mining techniques, the building of a structured and dynamic control suite with dashboard components.
- **DecisionStudio-Professional:** Comprehensive GPL desktop BI platform built on best-of-breed open source projects including MySQL, R Environment, DBDesigner, iReport, Python, etc. It is an advanced graphical desktop data mining, reporting, modeling, and analysis environment comprehensive capabilities to each role in the analytics value chain.

Commercial Products used as business intelligence tools:

- ACE*COMM
- Actuate
- Alphablox
- Analysis Center Library
- Applix
- Business Objects
- Cognos
- Cyberscience
- DataHabitat
- Decision Technology
- Information Builders
- Hyperion Solutions Corporation
- KCI Computing
- MaxQ Technologies
- Metrinomics - Metrivox
- Microsoft Analysis Services
- MicroStrategy
- MIS DecisionWare
- OutlookSoft
- Panorama
- Pentaho
- ProClarity

- Oracle Corporation
- QlikView
- Siebel Systems
- SAP Business Information Warehouse
- SAS Institute
- Saksoft
- Synola Ltd
- Stratws.

Same as these Business tool is being discussed in detail in the following unit:

On Line Analytical Processing (OLAP)

OLAP is an acronym for *On Line Analytical Processing*. It is an approach to quickly provide the answer to analytical queries that are multi-dimensional in nature. It is part of the broader category business intelligence, which also includes ETL (Extract, Transform, Load), relational reporting and data mining. The typical applications of OLAP are in business reporting for sales, marketing, management reporting, business performance management (BPM), budgeting and forecasting, financial reporting and similar areas. The term OLAP was created as a slight modification of the traditional database term OLTP (On Line Transaction Processing).

Databases configured for OLAP employ a multidimensional data model, allowing for complex analytical and ad-hoc queries with a rapid execution time. Nigel Pendse has suggested that an alternative and perhaps more descriptive term to describe the concept of OLAP is Fast Analysis of Shared Multidimensional Information (FASMI). They borrow aspects of navigational databases and hierarchical databases that are speedier than their relational kin.

OLAP Functionality

OLAP takes a snapshot of a set of source data and restructures it into an OLAP cube. The queries can then be run against this. It has been claimed that for complex queries OLAP can produce an answer in around 0.1% of the time for the same query on OLTP relational data.

The cube is created from a star schema or snowflake schema of tables. At the centre is the fact table which lists the core facts which make up the query. Numerous dimension tables are linked to the fact tables. These tables indicate how the aggregations of relational data can be analyzed. The number of possible aggregations is determined by every possible manner in which the original data can be hierarchically linked. For example a set of customers can be grouped by city, by district or by country; so with 50 cities, 8 districts and two countries there are three hierarchical levels with 60 members. These customers can be considered in relation to products; if there are 250 products with 20 categories, three families and three departments then there are 276 product members. With just these two dimensions there are 16,560 (276 * 60) possible aggregations. As the data considered increases the number of aggregations can quickly total tens of millions or more.

The calculation of the aggregations and the base data combined make up an OLAP cube, which can potentially contain all the answers to every query which can be answered from the data. Due to the potentially large number of aggregations to be calculated, often only a predetermined number are fully calculated while the remainder are solved on demand.

Types of OLAP

There are three types of OLAP.

Multidimensional OLAP

MOLAP is the 'classic' form of OLAP and is sometimes referred to as just OLAP. MOLAP uses database structures that are generally optimal attributes such as time period, location, product or account code. The way that each dimension will be aggregated is defined in advance by one or more hierarchies.

Relational OLAP

ROLAP works directly with relational databases.The base data and the dimension tables are stored as relational tables and new tables are created to hold the aggregated information.

Hybrid OLAP

There is no clear agreement across the industry as to what constitutes "Hybrid OLAP", except that a database will divide data between relational and specialized storage. For example, for some vendors, a HOLAP database will use relational tables to hold the larger quantities of detailed data, and use specialized storage for at least some aspects of the smaller quantities of more-aggregate or less-detailed data.

Comparison

Each type has certain benefits, although there is disagreement about the specifics of the benefits between providers. MOLAP is better on smaller sets of data, it is faster to calculate the aggregations and return answers and needs less storage space. ROLAP is considered more scalable. However, large volume pre-processing is difficult to implement efficiently so it is frequently skipped. ROLAP query performance can therefore suffer.

HOLAP is between the two in all areas, but it can pre-process quickly and scale well. All types though are prone to database explosion. Database explosion is a phenomenon causing vast amount of storage space being used by OLAP databases when certain but frequent conditions are met: high number of dimensions, pre-calculated results and sparse multidimensional data. The difficulty in implementing OLAP comes in forming the queries, choosing the base data and developing the schema, as a result of which most modern OLAP products come with huge libraries of pre-configured queries. Another problem is in the base data quality - it must be complete and consistent.

Other types

The following acronyms are also used sometimes, although they are not as widespread as the ones above

- WOLAP - Web-based OLAP
- DOLAP - Desktop OLAP
- RTOLAP - Real-Time OLAP.

APIs and query languages

Unlike relational databases - which had SQL as the standard query language and wide-spread APIs such as ODBC, JDBC and OLEDB - there was no such unification in the OLAP world. The first real standard API was OLEDB for OLAP specification from Microsoft which appeared in 1997 and introduced the MDX query language. Several OLAP vendors - both server and client - adopted it. In 2001 Microsoft and Hyperion announced the XML for Analysis specification, which was endorsed by most of the

OLAP vendors. Since this also used MDX as a query language, MDX became the de-facto standard in the OLAP world.

Commercial OLAP products

Open Source OLAP

Palo - An Open Source MOLAP Server

Mondrian - An Open Source ROLAP Server
JPalo - Open Source Development Tools for Palo.

Data mining

Data Mining, also known as **Knowledge-Discovery in Databases (KDD)**, is the process of automatically searching large volumes of data for patterns..
Data Mining can be defined as "The nontrivial extraction of implicit, previously unknown, and potentially useful information from data and The science of extracting useful information from large data sets or databases." Although it is usually used in relation to analysis of data, data mining, like artificial intelligence, is an umbrella term and is used with varied meaning in a wide range of contexts. It is usually associated with a business or other organisation's need to identify trends. Data mining involves the process of analyzing data to show patterns or relationships and sorting through large amounts of data and picking out pieces of relative information or patterns that occur e.g. picking out statistical information from some data.

A simple example of data mining is its use in a retail sales department. If a store tracks the purchases of a customer and notices that a customer buys a lot of silk shirts, the data mining system will make a correlation between that customer and silk shirts. The sales department will look at that information and may begin direct mail marketing of silk shirts to that customer, or it may alternatively attempt to get the customer to buy a wider range of products. In this case, the data mining system used by the retail store discovered new information about the customer that was previously unknown to the company. Another widely used (though hypothetical) example is that of a very large North American chain of supermarkets. Through intensive analysis of the transactions and the goods bought over a period of time, analysts found that beers and diapers were often bought together. Though explaining this interrelation might be difficult, taking advantage of it, on the other hand, should not be hard (e.g., placing the high-profit diapers next to the high-profit beers). This technique is often referred to as *Market*

Basket Analysis

In statistical analyses, in which there is no underlying theoretical model, data mining is often approximated via stepwise regression methods wherein the space of 2^k possible relationships between a single outcome variable and k potential explanatory variables is *smartly* searched. With the advent of parallel computing, it became possible (when k is less than approximately to examine all 2^k models.) This procedure is called *all subsets* or *exhaustive* regression. Some of the first applications of exhaustive regression involved the study of plant data.

Data dredging

Used in the technical context of data warehousing and analysis, the term "data mining" is neutral. However, it sometimes has a more pejorative usage that implies imposing patterns (and particularly causal relationships) on data where none exist. This imposition of irrelevant, misleading or trivial attribute correlation is more properly criticized as "data dredging" in statistical literature. Another term for this misuse of statistics is *data fishing.*

Used in this latter sense, data dredging implies scanning the data for any relationships, and then when one is found coming up with an interesting explanation. (This is also referred to as "over fitting the model".) The problem is that large data sets invariably happen to have some exciting relationships peculiar to that data. Therefore, any conclusions reached are likely to be highly suspect. In spite of this, some exploratory data work is always required in any applied statistical analysis to get a feel for the data, so sometimes the line between good statistical practice and data dredging is less than clear.

One common approach to evaluating the fitness of a model generated via data mining techniques is called *cross validation*. Cross validation is a technique that produces an estimate of generalization error based on resampling. In simple terms, the general idea behind cross validation is that dividing the data into two or more separate data subsets allows one subset to be used to evaluate the *generalize ability* of the model learned from the other data subset(s). A data subset used to build a model is called a *training set*; the evaluation data subset is called the *test set*. Common cross validation techniques include the *holdout method*, *k-fold cross validation*, and the *leave-one-out method*.

Another pitfall of using data mining is that it may lead to discovering correlations that may not exist. "There have always been a considerable number of people who busy themselves examining the last thousand numbers which have appeared on a roulette wheel, in search of some repeating pattern. Sadly enough, they have usually found it." However, when properly done, determining correlations in investment analysis has proven to be very profitable for statistical arbitrage operations (such as pairs trading strategies), and furthermore correlation analysis has shown to be very useful in risk management. Indeed, finding correlations in the financial markets, when done properly, is not the same as finding false patterns in roulette wheels.

Most data mining efforts are focused on developing highly detailed models of some large data set. Other researchers have described an alternate method that involves finding the minimal differences between elements in a data set, with the goal of developing simpler models that represent relevant data.

Notable uses of data mining

- Data mining has been cited as the method by which the U.S. Army unit Able Danger supposedly had identified the 9/11 attack leader, Mohamed Atta, and three other 9/11 hijackers as possible members of an al Qaeda cell operating in the U.S. more than a year before the attack.

Software (Commercial Software available)

- R programming language R is statistical environment and programming language that fits well for machine learning and data mining.
- Microsoft Analysis Services - Microsoft SQL Server 2005 contains a full suite of data mining algorithms and tools integrated with the database, OLAP, Reporting, ETL pipeline, and the development environment.
- Weka Open source data mining software written in Java.
- Neural network software.
- Java Data Mining.

Business performance management

Business performance management (BPM) is a set of processes that help organisations optimize business performance. BPM is seen as the next generation of business intelligence (BI). BPM is focused on business processes such as planning and forecasting. It helps businesses discover efficient use of their business units, financial, human, and material resources.

BPM involves consolidation of data from various sources, querying, and analysis of the data, and putting the results into practice.

BPM enhances processes by creating better feedback loops. Continuous and real-time reviews help to identify and eliminate problems before they grow. BPM's forecasting abilities help the company take corrective action in time to meet earnings projections. Forecasting is characterized by a high degree of predictability which is put into good use to answer *what-if* scenarios. BPM is useful in risk analysis and predicting outcomes of merger and acquisition scenarios and coming up with a plan to overcome potential problems.

BPM provides key performance indicators (KPI) that help companies monitor efficiency of projects and employees against operational targets.

Metrics / Key Performance Indicators

BPM often uses key performance indicators (KPIs) to assess the present state of business and to prescribe a course of action. More and more organisations have started to make data available more promptly. In the past, data only became available after a month or two, which did not help to suggest to managers that they should adjust activities in time to hit targets. Recently, banks have tried make data available at shorter intervals and have reduced delays. For example, for businesses which have higher operational/credit risk loading (for example, credit cards, A large multi-national bank makes KPI-related data available weekly, and sometimes offers a daily analysis of numbers. This means data usually becomes available within 24 hours, necessitating automation and the use of IT systems.

Most of the time, BPM simply means use of several financial/non-financial metrics/key performance indicators to assess the present state of business and to prescribe a course of action.

1) Some of the areas in which top management analysis could gain knowledge from BPM:
   a) Customer-related numbers:
   b) New customers acquired
   c) Status of existing customers.
2) Attrition of customers (including breakup by reason for attrition)
3) Turnover generated by segments of the customers - these could be demographic filters.
4) Outstanding balances held by segments of customers and terms of payment - these could be demographic filters.
5) Collection of bad debts within customer relationships.
6) Demographic analysis of individuals (potential customers) applying to become customers, and the levels of approval, rejections and pending numbers.
7) Delinquency analysis of customers behind on payments.

This is more an inclusive list than an exclusive one. The above more or less describes what a bank would do, but could also refer to a telephone company or similar service sector company.

What is important?

1) KPI related data which is consistent and correct.
2) Timely availability of KPI-related data.
3) Information presented in a format which aids decision making
4) Ability to discern patterns or trends from organised information.

BPM integrates the company's processes with CRM or ERP. Companies become able to gauge customer satisfaction, control customer trends and influence shareholder value.

BI Vendors: Some of the BI vendors are shown below:

- Business Objects
- Cognos
- EFM Software
- Hyperion Solutions Corporation
- OutlookSoft
- Prophix Software Inc.
- Saksoft
- SAP AG
- SAS Institute
- Systems Union.

3.9 BUSINESS INTELLIGENCE REPORTS

Reporting is a fundamental business requirement as every transaction-based enterprise application, every database, and each process that workers perform on a day-to-day basis needs reporting in some fashion. Reporting allows the users to access, format, and securely deliver data as meaningful information. The power of Business Objects reporting provides the user with the information they need, when they need it — inside and outside the organisation. Reporting and analysis have become persistent in business, and they must be seen as a core requirement and be held to the same standards as all core technologies.

The reporting and analysis market is mature. Companies have a wide variety of technology options, from a plethora of BI vendors to platform and application vendors. The participation by so many vendors reflects two issues:

- *Companies want a single BI reporting and analysis solution:* Every company and government organisation wants a single, standard reporting and analysis solution for the entire organisation as they need to drive down IT support costs and simultaneously increase the likelihood of a single version of critical data.

- *Vendors want to be selected as the BI reporting and analysis standard:* Simply put, the vendor that offers the most comprehensive BI reporting and analysis solution is in a better position of being selected as the reporting standard. To that extent, there has been a significant amount of activity by the vendors during the past years to deliver a broader BI reporting and analysis platform.

Requirements of the Reporting solution are:

Powerful Authoring: Business Objects reporting requires a powerful, flexible, and open environment for report creation. You need to connect to any data, and then build highly-formatted reports using intuitive, flexible design tools. In addition, you require the ability to integrate end-user report viewing, printing, exporting, and creation capabilities into applications using a comprehensive set of software developer kits and powerful report processing services.

Flexible Sharing: Once a report is created, you need to publish it on the web, portals, printers, email, and applications. In enterprise reporting, Business Objects need to provide a BI platform for secure, highly scalable information delivery to handle large numbers of end users around the world. For embedded reporting, we need to provide open application integration and flexible deployment. Our products are required to integrate tightly with existing infrastructure to meet even the most demanding enterprise and embedded reporting requirements. Reports may be required to be integrated into Java, .NET, and COM applications and deployed on Windows, UNIX, and Linux.

Reporting — the Way Users Work: For end users, reports need to include built-in interactivity, creating a clean and efficient process where one report will satisfy the needs of many different individuals. Users need to not only view reports in web portals, but they also need to explore the information by moving easily from static consumption to insightful interaction. What's more, users may require embedding and securely sharing live reports or parts of reports inside Microsoft Office Word, PowerPoint, and Excel documents.

Proven Technology: The vendor needs to adopt proven technology which has evolved over time to become the de facto accepted standard for reporting. It should have compatibility with leading enterprise application software like SAP, IBM, Microsoft, Oracle/PeopleSoft, Borland, and BEA.

Types Of Reporting and Analysis Solutions: There are three types of solutions available as shown below. Some of the vendors who supply solutions have also been indicated.

At its core, reporting technology is required to be designed for information distribution. Whether it's ad-hoc or predefined, the reporting paradigm have to address the information delivery, publishing and distribution. That is why reporting products generally have menu items that predefine the query, format the resulting data and then publish that report to the people it was designed for.

When describing BI technologies, reporting is often lumped together with analysis to categorize a technology as "reporting and analysis." This makes some sense because analysis is what users ultimately do with a report once it is received. If the user knows ahead of time what data is needed and considers the job complete once the report has been published, then reporting technology is the right tool for the job. Every information consumer in the organisation, from executives to production workers, will use these reporting systems.

However, if the user's job is to make decisions, this "delivery" model may only be adequate in certain circumstances and be significantly inadequate in others. The most popular feature in any reporting system is the "Export to Excel" button simply because the decision maker's job with the data is not done when the information is delivered - the job has just begun.

Using the Repository for More Productive Report Development

Many report designers keep a set of reports that contain pieces of reports that they would use over and over. In many cases, these reports would contain corporate logos, commonly used objects (like a company's address), and even some typical formula logic. Report designers copy and paste these objects between these "warehouse reports" and the newly created reports on a regular basis. This technique saves the designer some time, as they do not have to recreate these objects for each new report. But, what happens when business logic changes and needs to be updated? This happens quite often and is a critical piece of the reporting puzzle. The only tried-and-true method of the past does not solve the problem of how to update business logic or formulas in reports that has already been created. The report designer has to remember which reports may have been affected, open each individual report, and update them by hand-coding the changes. This process is cumbersome and time-consuming but mission critical. One common location to store and update report objects can dramatically improve this situation.

For accomplishing improvement of the productivity of the report design process a centrally managed location is required so that report designers can access, update, reuse and share report objects. To extend this concept, report objects can also be shared and reused among multiple report designers for even greater efficiency.

The **Repository** is a central database that contains common report objects that can be shared and reused. The types of report objects that can be shared via the repository are:

- *Text Objects:* Reusable text, such as company addresses or confidentiality statements
- *Images: Pictures or logos*
- *Custom Functions: Business logic that can be reused by passing in new fields as variables*
- *SQL Commands: Encapsulated database commands that produce tables to report from. These SQL statements can also be parameter driven.*

The Repository is independent from all other databases connected to any report. It manages logic, is a standalone database formatting, and objects. But most importantly, by its very nature as a separate library (or database), it is referenced by the report when the report is opened, and, as a result, it can actually update the repository objects automatically for the report designer so that the added overhead of copying new logic and objects is eliminated.

To add an object to the Repository, it's as simple as dragging and dropping the object into a folder in the Repository Explorer. The Repository Explorer represents the repository database as a tree structure made up of folders and objects. The structure of the repository folders is up to the person working with the repository. Within the Repository Explorer, the report designer has to have access to the repository objects that can be placed on the report design surface. Text objects and image objects are visible from the Repository Explorer. To use Repository Objects in your reports, simply drag-and-drop these objects on to the report as required.

SQL commands and their properties are visible in the Repository Explorer. You do not drag-and-drop these objects on the report as they are used in the Database Expert. You can use SQL Commands like database tables when you're designing your report. You can save your SQL statements in the repository for later use with the SQL Command in Repository feature.

Trends

Quality reports are critical. It is not a very unusual scene to find that executives arrive at meetings armed with spreadsheets only to find that each has different values for the same metrics. The rest of the meeting is then spent arguing over whose numbers are correct, rather than in actual decision making based on consistent numbers. This malaise is largely an offshoot of data fragmentation, the fracture of a single version of operational truth into multiple data sources, often not correlated with each other. The most significant part of providing quality reports is the choice and architecture of your reporting solution.

Quality aside, another important facet of reporting is delivery. Users want reports to be personalized, organised, timely, easily accessible and in their preferred format. For example, in today's business environment it is desirable to be able to e-mail reports to colleagues, create spreadsheets from report results and access reports securely over the internet.

One aspect of reporting that is frequently overlooked is its integration with other IT infrastructure elements. We have seen some customer departments so completely focused on "solving the reporting problem" — evaluating checklists of features from various vendors, reading analyst reports on each vendors – that they fail to coordinate this effort with the bigger company wide picture of how that reporting piece fits into other infrastructure (such as the central security repository or caching strategy). These customers then find themselves in the position of having to stitch together their data warehouse, reporting, security and portal solutions and own the problem of identifying the correct vendor to call.

Check Your Progress 2

1) State whether True or False

(a) Expert System can be defined as *"A computer program with the expertise embodied in it, based on the expertise of the knowledge worker"*. True ☐ False ☐

(b) Artificial intelligence is defined as intelligence exhibited by an artificial entity like a computer. True ☐ False ☐

(c) Distinction between the terms "Neural Network" and "Artificial Neural Network" can be "Neural network" indicates networks that are software based and "Artificial Neural Network" normally refers to those which are hardware-based. True ☐ False ☐

(d) Evolutionary Algorithms is "an algorithm that maintains a population of structures (usually randomly generated initially) that evolves according to rules of selection, recombination, mutation and survival referred to as genetic operators. True ☐ False ☐

(e) Business analytics solutions available must have at least three 3 components i.e. Executive dashboards with drilldown analysis capabilities, OLAP tools and Reporting generation facilities. True ☐ False ☐

(f) On Line Analytical Processing is an approach to quickly providing the answer to analytical queries that are dimensional in nature.

(g) Data Mining can be defined as the science of extracting useful information from large data sets or databases. True ☐ False ☐

(h) Business performance management is the management technique which helps organisations to optimize business performance. True ☐ False ☐

(i) The types of report objects that can be shared via the repository are Text Objects, Images, Custom Functions and SQL Command . True ☐ False ☐

2) Answer the Following Questions:

(a) For Business Intelligence programme implementation, what questions must be asked / answered to ensure that BI goals are achieved?

……………………………………………………………………………

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(b) Name the minimum essential requirements for Reporting Solution to be selected.

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3.10 SUMMARY

In this unit we have discussed the most recent and talked about topics of knowledge management, artificial intelligence and business intelligence. These topics in this unit have been discussed in detail to make students ready for the real professional life also list of the vendors who offer these commercial packages has been given. So that you can through more detailed information about these commercial packages from the websites which will definitely improve your knowledge about these softwares.

Artificial / business intelligence areas are presently at the further developing stage and are becoming more complex, particularly the area of neuro networks which has many options; therefore, the discussion has been confined more to uses rather than development aspects, as those do not fit in this course.

3.11 SOLUTIONS / ANSWERS

Check Your Progress 1

1) True or False

(a) True, (b) True, (c) False, (d) True, (e) False,
(f) False, (g) True.

2) Solutions/Answers

(a) The factors which make knowledge management implementation difficult in an organisation are:

- Geographically different locations for offices / units.
- language
- areas of expertise
- internal conflicts (e.g., professional territoriality)
- generational differences
- union-management relations
- incentives
- the use of visual representations to transfer knowledge (Knowledge visualization)

Check Your Progress 2

1) True or False

(a) False, (b) True, (c) False, (d) True, (e) True,
(f) True, (g) True, (h) False,

2) Solutions/Answers

(a) For Business Intelligence programme implementation, the questions that must be asked / answered to ensure that BI goals are achieved

- *Goal Alignment queries*:
- *Baseline queries:*
- *Cost and risk queries:*
- *Customer and Stakeholder queries:*
- *Metrics-related queries:*
- *Measurement Methodology-related queries:*
- *Results-related queries.*

(b) The minimum essential requirements for Reporting Solution to be selected are:

- *Powerful Authoring*
- *Flexible Sharing*
- *Reporting—the Way Users Work*
- *Proven Technology.*

3.12 FURTHER READINGS/REFERENCES

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UNIT 4 SOCIAL, ETHICAL AND LEGAL ASPECTS

Structure **Page No.**

4.0 INTRODUCTION

The information systems, Internet and the World Wide Web have grown rapidly and are now used by millions of people worldwide. Their importance in every day life is well known, however, it is also important to realise that the information systems and Web are what we make them and the code of ethics and morals we apply on these. The Objective of this unit is to make all students familiar with the negative aspects of information systems.

The issues related to morals, ethics and privacy of information and action and the security of information systems are, increasingly, a focus of concern for the business community and the public at large. Accordingly, ethics, morals, privacy and security are active topics of discussion from a wide range of perspectives. We will be bringing in these concerns for deliberation in this unit.

4.1 OBJECTIVES

After going through this unit, you should be able to:

- appreciate the impact of information systems (IS) on society;
- recognise the effect of the changes in Information Technology on moral dimensions and ethical issues;
- appreciate the ethical principles and dilemma on account of information system;
- discuss responsibility, accountability and liability in the use and application of information system, and
- become familiar with information rights and intellectual property rights.

4.2 SOCIETY IN THE INFORMATION AGE

The commercialisation of information communication technologies has been widely recognised as an important tool for economic growth. Strategies to utilise information technology for development priorities and prospects vary from sector to sector, and from country to country.

Development Opportunities and the Information Age

There is an established consensus that the information age offers significant potential for growth in all countries. The benefits of communications networks, principally reduced transaction costs and the ability to overcome impediments to productivity are especially important in considerations of how developing countries might more fully participate in the global economy.

Despite the acknowledged potential of the information age for economic growth, most developing countries have yet to significantly benefit from the vast resources and opportunities made possible by information technology. There remains considerable uncertainty about the specific ways information technology can be applied to development goals and to promote identified objectives. Determining critical elements of a regulatory environment conducive for growth and development is particularly challenging, given the context- specific nature of the benefits of information technologies for productive economic and social activity. Importantly, the pervasive role of intellectual property rights in regulating almost all aspects of the digital economy has been insufficiently analysed as part of a broad development agenda for the digital economy. Patents, particularly pharmaceutical patents, have long been the subject of concern in and discussion of the role of intellectual property in development. This has occasioned neglect of other intellectual property rights such as copyright and trademarks. Yet, copyright law is essential to the viability of the Internet as a development tool. Virtually all aspects of the digital economy are affected by copyright or recent quasi-copyright systems that provide rights for technological protections of digital content. Copyrights, trademarks and patents each, and in some cases jointly, impact prospects for electronic commerce, access to computer software, the possibility of marketing cultural goods, the availability of educational content and much more. In short, intellectual property regulation permeates all aspects of the development opportunities occasioned by the commercialisation of information technology.

Broad Applications of Information Technology

Information technology has been applied to enhance four major categories of activities: governance, growth and supply / distribution of goods and services, adding value to existing services and the creation of new products and services. The range of activities that can benefit from information technology appears to be unlimited. Specifically however, the important issues for developing countries include how information technology can be used to overcome existing barriers in markets such as high transaction costs, inefficiencies in production, distribution and supply, while adding value to existing products and services and also creating new ones. Economists have noted that the failure of credit markets has been a major reason for underdevelopment. The prospects for secure electronic funds transfer may open up opportunities for financing entrepreneurial activity, which is important to stimulate local investment in information products. Investment in physical capital is critical to facilitate the use of new technologies in the production process. Investment in software is also particularly important. In OECD countries, software investments in the year 2000 accounted for over 50% of the investment in information technology. For local productivity to benefit from information technology, then, access to equity will be a vital component. Such access may be enhanced and facilitated by financial agreements through business to business (B2B) collaborations or other forms of financing by financial services available through the Internet.

Another key factor for growth is the quality of local labor. In this regard, the vast amount of educational resources available on the Internet is a critical resource for developing countries, as well as by linkages to institutions in developed countries. This extends beyond prospects for formal education. Specialised learning and ongoing informal education can take place through chat-rooms and other interactive forums enabled by the Internet. While the Internet cannot and should not replace structured educational systems, it is important to point out that the Internet has made it possible to access recent and up to date information about any number of subjects, and to improve the quality of materials currently available in developing and least developed countries. These uses can also have a hortatory effect on the quality of life in developing countries by improving the quality of general participation in civil society and ultimately, democratic governance and delivery of government services.

Information technology can be used to address infrastructural barriers that have hindered traditional supply and distribution chains in developing countries. However, this benefit only goes to products or services that have no "real time/space" component. In reality, most e-commerce transactions still require physical infrastructure such as a dependable postal service, electricity, phone lines, etc., to function effectively. Only fully digital products are significantly insulated from the need for and dependence on the infrastructural capacity. With respect to developing countries then, it is important to identify how applications of information technology might contribute to economic growth, the particular sectors that would benefit particularly from information technology, and the legal rules that are most closely related to these sectors.

Some Emerging Considerations

i) The Information Technology and Intellectual Property Interface

Despite indications of commitment from developed countries to support the integration of information technologies into development programs, most of the activities undertaken in the light of these commitments have failed to examine the important relationship between the regulation of information technology and global rules for intellectual property protection. As some scholars have argued, the information economy may require different rules with respect to the protection of content or even hardware, than the traditional economy. The contested boundaries between trademarks for domain names, business method patents for Internet businesses, and copyright protection for content all threaten precipitously to recreate high margins of difference between developed and developing countries. The irrepressible move to create a global property rights system in data and databases, both of which are the primary constitutive elements of the Internet and associated applications, together with the existing multilateral agreements create an unhealthy environment for development. In this "back to the future" paradigm, developing countries will be bound by international agreements that constrain their efforts to access the building blocks of economic growth which consist of access to content and competitive opportunities to create new markets and new products. It is important to note that this problem is not limited to developing countries; there continue to be conflicts and heated negotiations between stakeholders in developed countries about the nature and extent of rules designed for social and economic use of the information.

ii) Appropriating the Benefits of the Information Age

The Internet offers a dynamic set of technological tools, and is the subject of experimental regulatory frameworks and legal rules. It is unlikely that anything firm or consistently predictable will emerge any time soon to govern this digital space. For developing countries this presents both opportunities and challenges. Appropriating the benefits of the information age is directly related to how investments in information technology are influenced and supported by regulatory frameworks that promote innovation, access and use. In addition to capital investments in information technology, developing countries should undertake to invest in the necessary macroeconomic policies that will facilitate an environment where the domestic population is able to adapt to the existence of the Internet, and to encourage entrepreneurial uses of the different opportunities that information technology can offer to deal with existing distribution, dissemination and communication problems that bedevil developing country markets.

Information asymmetries introduced or supported by legal rules such as intellectual property rights, or regulatory policies affecting competition in the provision of telecommunications services, can skew the competitive advantages that information technologies offer for developing countries. The following points summarize important factors that need to be kept in mind in formulating information policies with a development focus.

1) Despite the emphasis on the need for a strong telecommunications infrastructure for greater physical access to the Internet, the development of third generation Internet technologies through satellite suggests that in a short period of time even this major problem may not be a significant barrier for access to the Internet. An important task, then, is to develop guidelines concerning how much developing country resources should be invested in adapting to the current Internet state of the art given the dynamic rate of innovation in communications technology. These are questions that require careful and sustained empirical analysis to ensure that in developing countries the digital divide does not remain a permanent feature of the information age.

2) Exploiting the potential of the Internet to facilitate development objectives requires access to hardware (computers), software and content. Innovation, competition and deregulation in the telecommunications industry will enhance the opportunities for access to hardware by citizens. Intellectual property agreements have important implications for access to software and digital content. In the context of software, developing countries need to explore alternatives to proprietary regimes, the most important being the Open Source model which has proven to be a dynamic and, in some instances, more effective model of software development. For developing countries the Open Source model is not just beneficial for improving access to software, but also for the opportunities it offers to facilitate the training of domestic software engineers, and the relatively low cost of complementary technologies.

3) Business method patents can have inhibiting effects on competition in new markets and the opportunities made possible by information technologies. Most economic analyses of business method patents suggest that such patents have an inimical effect on competition and organizational innovation. Developing countries should preserve domestic policy space to make decisions that are consistent with development priorities by adopting, as India has done, a *per se* rule against the patentability of business methods.

4) International copyright agreements have a significant and unavoidable impact on access to creative works in the digital age. The two WIPO Internet treaties have been implemented in a few developed countries in a manner that is highly restrictive and that imposes undue social costs on consumers. Developing countries should be aware that these two treaties affect access by wire and wireless means, and domestic limitations or exceptions to the rights granted by the treaties are likely to be influenced by interpretations of the TRIPS Agreement. Developing countries must insist on the possibility of enacting domestic limitations, including the application of compulsory licenses, to digital works.

5) The Appendix to the Berne Convention is currently the most prominent access model to literary works in international copyright law (Reference: www.unesco.org/culture/laws/copyright/images/copyrightconvention.rtf, The complete text of the Berne Convention and appendices can also be found at http://www.law.cornell.edu/treaties/berne/overview.html) However, developing countries have not successfully utilized the provisions of the Appendix with regard to facilitating access to protected works through compulsory licenses. Consequently, an alternative model must be considered. *Developing countries should consider, for example, adopting ad hoc provisions to deal with copyright*

in digital works, rather than adopting wholesale treaty provisions that may deprive them of policy options more conducive to national priorities. What is ultimately important is that, in the context of multilateral or bilateral negotiations, developing countries must appreciate the importance of copyright to the ability to access and realize the benefits of information technology and information goods. Robust access principles in the international agreements, or the freedom to impose such access mechanisms domestically, must be preserved for development purposes.

6) Institutions of higher learning are an important aspect of developing a strong technology base in any society. The possibility of distance education learning should occupy a central place in development strategies for the information age. This will require implementation of copyright treaties in a way that ensures that proprietary rights are balanced with public policy limitations that permit use and access for educational purposes, distinct from other socially beneficial uses.

4.3 MORAL DIMENSIONS

There are five moral dimensions (a) information rights, (b) property rights, (c) accountability, liability, and control, (d) system quality, and (e) the quality of life. Let us examine these in details.

a) Information Rights

With respect to privacy and freedom in an Information Society there have been some attempts to regulate the collection and use of information about individuals, as explained in Table 1.

Table 1: Principles of Fair Information Practices

1. There should be no personal records system whose existence is secret.
2. Individuals have right to access, inspect, review and amendment to systems that contain information about them.
3. Without prior consent there must be no use of personal information for purposes other than those for which it was gathered.
4. Managers of systems are responsible and can be held accountable and liable for the damages done by systems for their reliability and security.
5. Governments have the right to intervene in the Information relationships among private parties.

Many of us take our **privacy** and freedom for granted. It needs to be noted how technology is changing and challenging our basic assumptions about these issues; for example, video rental records are more protected from misuse and prying than are your medical records.

We all assume that the Constitution guarantees by us personal privacy and freedom from surveillance. If someone sets up a video camera inside your drawing room or on your front porch to monitor your every movement, what would you do? Such cases have happened, it's a fact. So how do we protect our privacy and freedom from surveillance in a high-tech world?

If ebay.com or rediff.com or Buy.com wants to collect information about your surfing habits and sell it to other companies, there is nothing to stop them. Absolutely nothing! However, in May 2006 with regard to Privacy for Phone Calls an Act has been passed by Govt. of India (rajyasabha.nic.in/bills-ls-rs/2006/XLI_2006.pdf)). As per this Act no body can make unsolicited calls for commercial or other illegal benefits.

Think about this: If information is supposedly collected for one purpose, is it ethical for that information to be used for a totally different purpose without your knowing it? Is it fair to require you to provide medical information that is primarily intended to be used to pay your insurance bills and then have that same information used against you when the insurance company deems you too expensive and cancels your policy? Is it fair to have that same information used against you in denying you employment because you're too expensive to hire?

Spamming (unsolicited emails) has been challenged in the courts by Internet Service Providers (ISP) as an unfair practice. The ISPs say the thousands of emails clog their systems and no one wants them anyway. The spammers argue that their right to Freedom of Speech is violated if they can't send emails to anyone they want. Which side are you on?

b) Property Rights: Intellectual Property

Intellectual property issues have been around for hundreds of years. Some of the laws and policies in place to settle disputes about **copyrights, patents**, and **trade secrets** have to be rewritten to apply to the Internet. Intellectual property is a result of someone's effort to create a product of value based on their experiences, knowledge, and education. In short, intellectual property is brain power.

What if you wrote the next great American novel, hoping to cash in big time? Maybe you could retire to the Bahamas and drink lemonade on the beach all day. But then you find out that someone posted your next great American novel to the Internet and everyone is reading it free of charge. Now you're back in your hometown drinking lemonade at the local mall while you decide whether to look for a job at McDonald's or Burger King. The good news is everyone loves your book!

Unfortunately, that sort of thing happens too often in cyber-world. You're pretty excited to get that free copy of the newest game software while the poor guy who spent hours of his time and effort writing it is not so excited to realise he's not getting any compensation.

Everything on the Web is considered to be protected under **copyright** and **intellectual property** laws unless the Web site specifically states that the content is public domain. The Web site doesn't need to carry the copyright symbol © in order for it to be protected. In the US, President Clinton signed a law in January 1998 making it a federal offense to violate copyright laws on the Internet, punishable with a fine up to $250,000.

Copyright laws and intellectual property rights cannot be violated on the Internet any more than they can be violated in other mediums. While this isn't a law class, you should be aware of the fine line between acceptable and legal usage of materials and the illegal theft of materials. When it comes to copyright material, the underlying ideas are not protected, just the publication of the material. On the other hand, a patent grants a monopoly on the underlying concepts and ideas. Before you use anything, especially any material on the World Wide Web, make sure you are using it legally and ethically.

Get past the idea that because everything on the Web is free, easy, and available 24 hours a day, it must be okay to use it however you want. The question you should be asking yourself is "s it ethically right and legal?"

c) Accountability, Liability, and Control

Many of our laws and court decisions establishing precedents in the area of **accountability**, **liability**, and **control** were firmly in place long before computers were invented. Many of them date back to the early 1900s, and some simply don't make sense in this day and age. That's what we were referring to when we talked about new questions for organisations, companies, and the workplace in general. No issue makes this subject more important than the Internet laws our government has tried and still tries to pass. Government of India has enacted a comprehensive law in the form of IT Act 2000 (Ref http://www.legalserviceindia.com/cyber/cyber.htm).

However, in the US, the opinion of the Communications Decency Act (struck down by the courts) and the Child Online Protection Act (currently in the courts) is that Internet Service Providers should somehow be liable for content placed on the Internet through their users. Ask yourself these questions: If you receive an obscene phone call, is the telephone company responsible and liable for the problem? If you receive a threatening letter in the mail, is the Post Office authority responsible for reading every piece of mail on the chance that there might be a problem in one of the letters?

d) System Quality: Data Quality and System Errors

As we rely on Information Systems more, data quality issues are gaining importance. These issues affect you as a consumer and as a user.

When the credit reporting agencies mess up your credit record and you can't get a car loan, whose fault is it? Yours or of the credit agency? What if you're driving down the road, the computer chip controlling your brake system fails, and you have a rather nasty crash? Who is at fault? You, the car company, or the company that made the computer chip?

Most of us use software that the manufacturer knows has bugs. Once in a while these bugs will affect our computer usage. Usually they are nothing more than an aggravation. If you review *Table 2* you'll see some instances of data quality problems that can severely affect businesses and corporations.

As more and more companies do business on the Internet, will Internet Service Providers be held accountable for equipment outages rendering those businesses unable to process transactions?

Table 2: Examples of Reported Data Quality

1. An airline inadvertently corrupted its database of reservations while installing new software and for months planes took off with half load.
2. A manufacturer attempted to recognise its files by customer number only to discover the sales staff had been entering a new customer number for each sale because of special incentives for new accounts. One customer was entered 7000 times. The company scrapped the software project after spending $ 1 million.
3. A manufacturing company nearly scrapped a $12 million data warehouse project because of inconsistently defined product data.
4. J.P.Morgan, a New York bank, discovered that 40% of the data in its credit risk management was incomplete, necessitating double check by users.
5. Several studies have established that 5 to 12 % of bar code sales at retail grocery and merchandise chains are erroneous and that the ratio of overcharges to undercharges runs as high as 5.1 with 4.1 as a norm. The problem tends to be human error keeping shelf prices accurate and corporate policy that fails to allocate sufficient resources to price checking, auditing and development of error file policies.

e) Quality of Life: Equity, Access, Boundaries

Invariably, when discussing online technology, some people mention their concern about losing the face-to-face contact with other human beings. We hear stories about children who haven't developed normal social skills because they spend all their time in front of a computer. No discussion about the quality of life issues would be complete without mentioning on-line love affairs. Of course, many people lose their jobs and their way of life because of technology. These are all valid concerns.

One quality of life issue that affects more and more people personally is the ability to work from home. Most telecommuters used to have a regular day job 9 to 5, five days a week in a typical office setting. If they didn't get their work done today, they would wait until they were back in the office tomorrow or Monday. Now because of technology they can work seven days a week, all hours of the day, at home. And sometimes they do. The impact on personal and family life can be considerable.

There is an upside to the jobs issue, though. Many parents like telecommuting because they can stay home with, or at least be nearer, their children. More and more people are leaving the big cities and moving to small towns for the quality of life, yet they can still keep their well-paying jobs. Many small companies are able to expand their customer base because of technology, which in turns helps the employees immensely. Completely new businesses are born because of technology.

Some people think we've reached the limit when they learn that we can now buy groceries online. After all, when you have everything loaded into the car, trying to find your way around a strange town, have three screaming kids in the back seat, and everyone is stressed out from the travel, the last thing you want to do is hunt down a grocery store. Why not email ahead and have your food and treats waiting for you when you check into your accommodations? What a terrific idea!

Computer crime is one area that has been extremely hard for our society and our governments to keep up with. Many laws have to be rewritten and many new laws must be implemented to accommodate the changes. **Computer crime and abuse** extends to any wrongdoing involving equipment and Internet usage, as *Table 3* shows. Anonymity cannot be a license for socially unacceptable behaviour. You should remember that everything you do on a network or the Internet is recorded and can be tracked. Many people committing computer crimes and abuse have been caught and prosecuted.

Table 3: Internet Crime and Abuses

Problem	Description
Hacking	Hackers exploit weaknesses in Web site security to obtain access to proprietary data such as customer information and password. They often use Trojan Horses posing as legitimate software to obtain information from the host computers.
Jamming	Jammers use software routines to tie up the computers hosting a Web site so that legitimate visitors cannot access the site.
Malicious Software	Cyber vandals use data flowing through the Internet to transmit computer viruses, which can disable computers they infect.
Sniffing	Sniffing is a form of electronic eavesdropping by placing a piece of software to intercept information passing from a user to the computer hosting a Web site. This information can include credit card numbers and other confidential data.
Spoofing	Spoofing is fraudulently misrepresents themselves as other organizations, setting up false Web sites where they can collect confidential information from unsuspecting visitors to the site.

Other issues affecting our society include job losses and career changes caused by technology. You can argue the positive or negative effects, but one thing is clear: you'll be a part of the evolution of technology for the rest of your life. You will have to continually update your skills and knowledge in order to remain competitive in the job market. As companies continue to embrace new technology and new methods of using it, you'll be responsible for ensuring your skills remain current.

Our government recognises the danger of allowing unequal access to technology to continue. It has enlisted the help of private individuals and corporations in an effort to install computers and Internet access in public schools and libraries across the nation. Most schools are now wired for networks and are learning to incorporate technology into the curriculum.

Health Risks: RSI, CTS, and Technostress

As managers, you should be acutely aware of the health issues caused by computer usage. Why? Because these health issues cost businesses huge amounts of money each year in medical treatment claims and lost productivity. **Carpal tunnel syndrome (CTS)** is the most serious health issue plaguing businesses. It doesn't take much to avoid the problems associated with computer usage. Ergonomics, the study of the relationship between humans and machines, has helped determine that it's cheaper to purchase equipment that reduces the health risks associated with computers such as different keyboards, monitors that reduce eye strain, and desks that allow proper body positions.

Too much of a good thing can be bad. You've heard of road rage, the anger people experience when driving. We are now experiencing road rage on the Information Superhighway, where it is called **techno-stress**. Managers should encourage employees to take frequent breaks from their computer and to recognize and understand the dangers of isolation. We may be a wired nation, but we still need the human touch.

How has all this technology affected you? Think about it. Ultimately, there is a positive and a negative side to everything. How you handle it determines how it affects you.

Management Actions: A Corporate Code of Ethics.

Many firms have not established a Code of Ethics or a policy for employee conduct when computing in today's workplace. Some corporations are confused about what to include and how to approach this new dilemma. It is felt that the five moral dimensions would be a good start. Businesses and their managers should recognise:

- The information rights to privacy and freedom
- The property rights to individual ideas and efforts
- The accountability, liability and control issues involved in using technology
- The system quality requirements of businesses and individuals
- The quality of life impact of technology

Companies can no longer ignore the necessity of establishing rules for technology usage. The issue will only continue to grow. If you work for a company that doesn't have a policy, you should encourage it to establish one immediately. If you're a manager in a company, you should get busy and establish a policy for your employees — it's the only fair thing to do.

4.4 TECHNOLOGY TRENDS AND ETHICAL ISSUES

New computer technologies for gathering, storing, manipulating, and communicating data are revolutionising the use and spread of information. Along the way, they are also creating ethical controversies. The speed and efficiency of electronic information systems, which include local and global networks, databases, and programs for processing information, force people to confront entirely new rights and responsibilities in their use of information and to reconsider standards of conduct shaped before the advent of computers.

The *Table 4* indicates the achievement due to technological progress of the Information System and their impact on the ethical issue.

Table 4: Information System Achievements and Issues

Achievement due to technological progress of Information System	**Impact / issue**
Computing power doubles every 18 months	Dependence on computer systems increases
Rapidly declining data storage costs	Easy to track a lot about individuals
Data mining advances	Analysis of vast quantities of data
Networking advances and the Internet	Remotely access, copy, share, and transfer personal data
New data and software standards agreed upon	data can be shared and processed easily
Mobile computing and tracking (radio frequency identification (RFID) product tracking tags	Effect: can be found anywhere & uniquely identified

The Importance of Ethics in Information Systems

Information is a source of power and, increasingly, the key to prosperity among those with access to it. Consequently, developments in information systems also involve social and political relationships — and so make ethical considerations in how information is used all the more important. Electronic systems now extend into all levels of government, into the workplace, and into private lives to such an extent that even people without access to these systems are affected in significant ways by them. New ethical and legal decisions are necessary to balance the needs and rights of everyone.

Ethics Fill the Gap as Legal Decisions Lag Behind Technology

As in other new technological arenas, legal decisions lag behind technical developments. Ethics fill the gap as people negotiate how use of electronic information should proceed. The following paragraphs define the broad ethical issues now being negotiated. Since laws deciding some aspects of these issues have been made, these paragraphs should be read in conjunction with Legal Issues in Electronic Information Systems.

Ethical Issues Specific to Electronic Information Systems

Ethics include moral choices made by individuals in relation to the rest of the community, standards of acceptable behaviour, and rules governing members of a profession. The broad issues relating to electronic information systems include control of and access to information, privacy and misuse of data, and international considerations. All of these extend to electronic networks, electronic databases, and, more specifically, to geographic information systems. Specific problems within each of the three areas, however, require slightly different kinds of ethical decisions.

Computer Crimes

Computer crime can be defined as an act of using a computer to commit an illegal act. The broad definition of computer crime can include the following:

- Targeting a computer while committing an offense (e.g., gaining entry to a computer system in order to cause damage to the computer or the data it contains).
- Using a computer to commit an offense (e.g., stealing credit card numbers from a company database).
- Using computers to support criminal activity (e.g., drug dealer using computers to store records of illegal transactions).

Computer Crimes and the Impact on Organisations

Dealing with viruses, PC theft and other computer-related crimes costs U.S. businesses a staggering $67.2 billion a year, according to the FBI report published in January 2006. The FBI calculated the price tag by extrapolating results from a survey of 2,066 organisations. The survey released found that 1,324 respondents, or 64 percent, suffered a financial loss from computer security incidents over a 12-month period.

The average cost per company was more than $24,000, with the total cost reaching $32 million for those surveyed. Often survey results can be skewed, because poll respondents are more likely to answer when they have experienced a problem. So, when extrapolating the survey results to estimate the national cost, the FBI reduced the estimated number of affected organisations from 64 persent to a more conservative 20 percent.

Under attack
Almost a fifth of U.S. businesses said they suffered 20 or more incidents such as virus infections in an FBI survey of computer security incidents at companies in the past year.

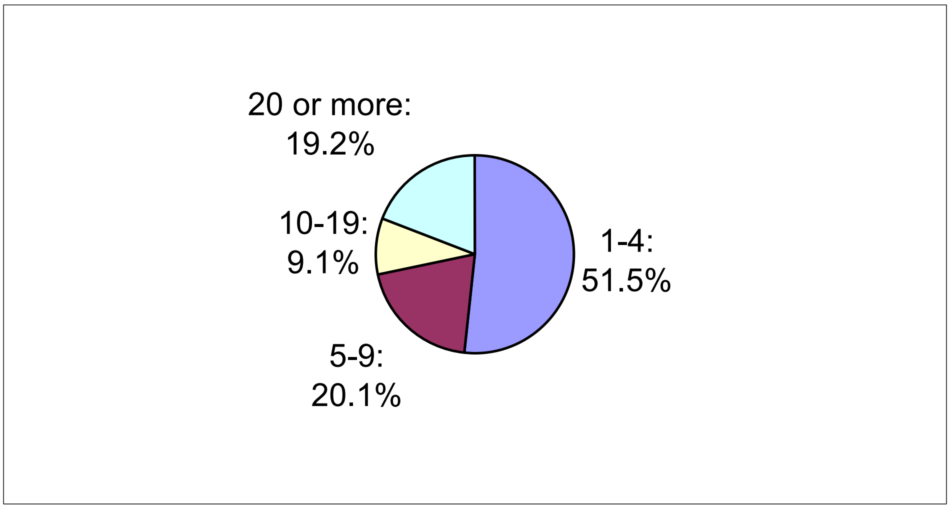

Figure 1: Loss by companies due to computer

This would be 2.8 million U.S. organisations experiencing at least one computer security incident, according to the 2005 FBI Computer Crime Survey. With each of these 2.8 million organisations incurring a $24,000 average loss, this would total $67.2 billion per year.

By comparison, telecommunication fraud losses are about only $1 billion a year, according to the U.S. Secret Service. Also, the overall cost to Americans of identity fraud reached $52.6 billion in 2004, according to Javelin Strategy and Research.

Other surveys have attempted to put a dollar amount on cyber security damages in the past, but the FBI believes its estimate is the most accurate because of the large number of respondents.

AS per FBI the data set is three or four times larger than in past surveys. It is obviously a staggering number, but that is the reality of what is seen. Responding to worms, viruses and Trojan horses was most costly, followed by computer theft, financial fraud and network intrusion, according to the survey. Respondents spent nearly $12 million to deal with virus-type incidents, $3.2 million on theft, $2.8 million on financial fraud and $2.7 million on network intrusions. These figures do not include much of the staff, technology, time and software employed to prevent security incidents,. Also, losses to individuals who are victims of computer crime or victims in other countries are not included.

Defenses in place

As per FBI report survey respondents use a variety of security products for protection. Antivirus software is almost universally used, with 98.2 persent of respondents stating they use it. Firewalls follow in second place, with 90.7 persent, and anti-spyware and anti-spam are each used by about three-quarters of respondents.

The results mean that close to one in 10 organisations does not have a hardware or software firewall. Or perhaps they don't know they have one — the Windows Firewall in Windows XP, for example. Some are very small businesses that should have that technology, but they don't.

Biometrics and smart cards--both relatively new security technologies--were used only by 4 percent and 7 percent of survey respondents respectively. Intrusion prevention or detection systems were used by 23 percent and VPNs, or virtual private networks, by 46 percent.

Organisations were attacked despite use of security products, with nine out of 10 respondents saying they experienced a security incident. In fact, the most common attacks aligned with the most commonly used defenses. Computer viruses, worms or Trojan horses plagued 84 percent of respondents, 80 percent reported spyware trouble, and 32.9 percent said attackers were probing their systems using network port scans.

Computer Crimes – Who Commits Them?

Not all threats came from outside the organisation. More than 44 percent of the FBI survey respondents reported intrusions from within the company. Companies may be unaware of the internal potential for computer security incidents.

Unauthorised access Trend

As per the data available the unauthorised data access is decreasing (see *Figure 2*) because of the growing awareness of the users who are using various protection techniques.

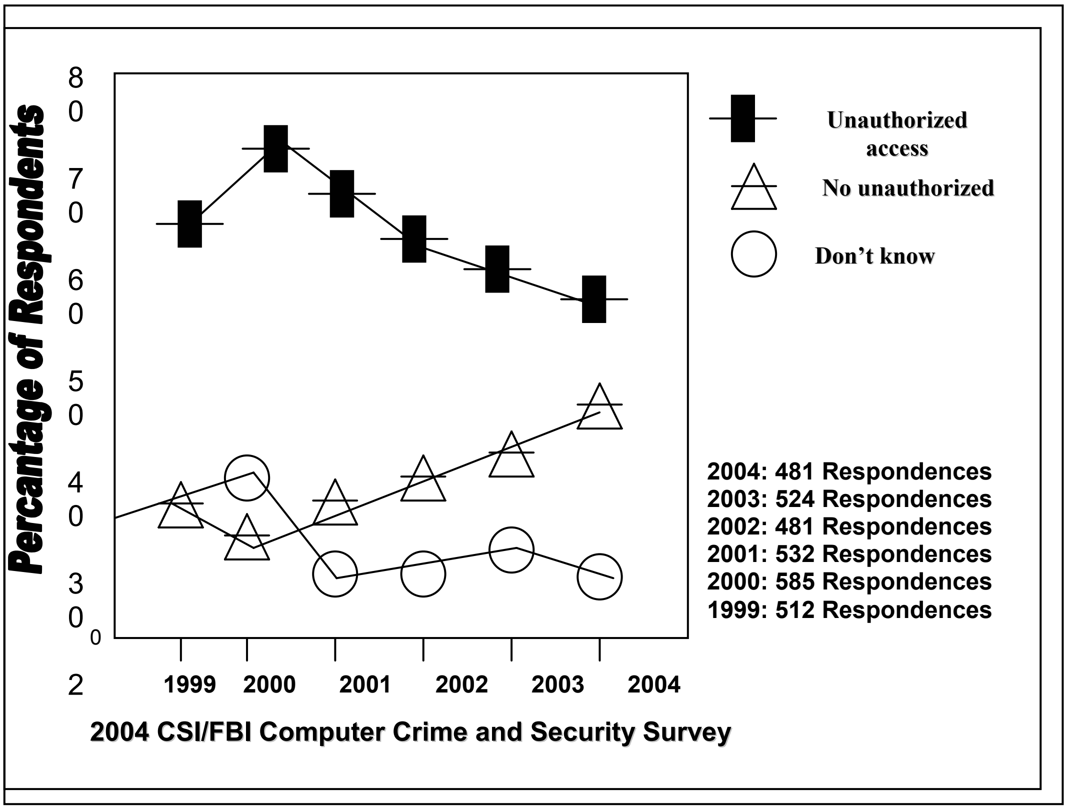

Figure 2: Unauthorized computer access trend

Computer Crime – Various Types

Let us look at the various types of computer crimes as explained in *Table 5*.

Table 5: Types of Computer Crimes

Data Diddling	The changing of data going into or out of a computer; for example, a student breaks into his/her university's grade recording system and changes the grades he/she earned in last semester's classes, thus raising his/her grade point average.
Salami Slicing	A form of data diddling that occurs when a person shaves small amounts from financial accounts and deposits them in a personal account, for example a bank employee deposits a few Rupees from each of thousands of accounts into an account set up in a fictitious name. The amounts are too small to raise flags, but over time the thief collects a substantial sum.
Phreaking	Crime committed against telephone company computers with the goal of making free long distance calls, impersonating directory assistance or other operator services, diverting calls to numbers of the perpetrator's choice, or otherwise disrupting telephone service for subscribers.
Cloning	Cellular phone fraud in which scanners are used to steal the electronic serial numbers of cellular phones, which are used for billing purposes and are broadcast as calls are made. With stolen serial numbers, clones can be made to make free calls that are billed to the owner of the original cell phone.
Carding	Refers to the practice of stealing credit card numbers online, to be resold or used to charge merchandise against victim's account.

Piggybacking or shoulder surfing	The act of simply standing in line behind a card user at an automated teller machine (ATM), looking over the person's shoulder, and memorizing the card's personal identification number (PIN). With the right equipment, the stolen numbers can then be placed on counterfeit access cards and used to withdraw cash from the victim's account.
Social Engineering	Gaining information needed to access computers by means of tricking company employees by posing as a magazine journalist, telephone company employee, or forgetful coworker to order to persuade honest employee to reveal password and other information. The information is then used to break into a computer system or to steal company equipment and other contraband.
Dumpster diving	This approach requires no technical expertise, since it consists simply of going through dumpsters and garbage cans for company documents, credit card receipts, and other papers containing information that might be useful.
Spoofing	A scam used to steal password for legitimate accounts on computers in which the spoofer uses a program that duplicates an organisation's login screen. When legitimate users login to the system, the counterfeit screen responds with an error message but secretly captures the user's ID and password. The swindle lets intruders pass as legitimate users, thus allowing them to steal computer time and resources.

Computer Crimes — Hacking and Cracking

Hackers is a term to describe unauthorised access to computers based entirely on a curiosity to learn as much as possible about computers. It was originally used to describe MIT students in the 1960s who gained access to mainframes. It was later used universally for gaining unauthorised access for any reason.

Crackers is a term to describe those who break into computer systems with the intention of doing damage or committing crimes. This was created because of protests by true hackers.

Computer Crime – Software Piracy

Software Piracy is the practice of buying one copy and making multiple copies for personal and commercial use or for resale is illegal in most countries while others offer weak or nonexistent protections. This has become an international problem as shown in *Table 6*.

Table 6: Software Piracy Levels in Various Regions

Region	**Piracy Levels (%)**	**Dollar Loss ($M)**
North America	23	7,232
Western Europe	36	9,600
Asia Pacific	53	7,553
Latin America	63	1,273
Mid East / Africa	56	1,026
Eastern Europe	71	2,111
(Source: BSA, 2004)		

Destructive Codes that Replicate

Viruses are the programs which disrupt the normal function of a computer system though **harmless pranks** or by **destroying files** on the infected **computer**. They come in several types:

- **Boot Sector** attaches to the section of a hard disk or floppy disk that boots a computer.
- **File Infector** attach themselves to certain file types such as .doc, .exe, etc.
- **Combination** viruses can change types between boot sector and file infector to fool antivirus programs
- **Attachment** released from an e-mail when an attachment is launched. Can also send themselves to address book

Worms are the destructive codes which also replicate and spread through networked computers but do damage by **clogging up memory** to slow the computer versus destroying files

Destructive Codes that do not Replicate

Trojan Horses are the programs which do not replicate but can do damage as they run hidden programs on the infected computer that appears to be running normally (i.e., a game program that creates an account on the unsuspecting user's computer for unauthorised access).

Logic or Time Bombs are a variation of a Trojan horse that also do not replicate and are hidden but they are designed to lie in wait for a triggering operation. (i.e., a disgruntled employee who sets a program to go off after leaving the company).

- **Time Bombs** are set off by dates (e.g., a birthday)
- **Logic Bombs** are set off by certain operations (e.g., a certain password).

Cyber war and Cyber terrorism

Cyber war is an organised attempt by a country's military to disrupt or destroy the information and communications systems of another country. Common targets include:

- Command and control systems
- Intelligence collection and distribution systems
- Information processing and distribution systems
- Tactical communication systems
- Troop and weapon positioning systems
- Friend-or-Foe identification systems
- Smart weapons systems.

Cyber terrorism is carried out through the use of computer and networking technologies against persons or property to intimidate or coerce governments, civilians, or any segment of society in order to attain political, religious, or ideological goals

Responses to the Threat

At greatest risk are those that depend highly on computers and networking infrastructure (i.e., governments, utilities, transportation providers, etc.) Responses include:

- Improved intelligence gathering techniques.
- Improved cross-government cooperation.
- Providing incentives for industry security investment.

4.5 ETHICAL PRINCIPLES AND DILEMMA

In today's information age, the social and ethical implications of information and communication technology (ICT) are enormous – and ICT is developing so rapidly that new possibilities emerge before the social consequences can be assimilated. New social / ethical policies for the information age, therefore, are urgently needed to fill rapidly multiplying "policy vacuums". But filling such vacuums is a complex social process that will require active participation of individuals, organisations, and governments – and ultimately the world community.

Globalisation has been given a practical shape by ICT developments and cyberspace has brought the word community closer for interaction and ICT has made possible – for the first time in history – a genuinely global conversation about ethics and human values. Such a conversation has implications for social policy that we can only begin to imagine. Traditional borders and barriers between countries have now become less meaningful because most countries are interconnected by the Internet. For this reason, individuals, companies and organisations in every culture can engage in global business transactions, distance education, cyber-employment, discussions of social and political issues, sharing and debating of values and perspectives. The points to be considered are; whether this "global conversation" will bring about better understanding between peoples and cultures? New-shared values and goals and new national and international laws and policies? Will individual cultures become "diluted," homogenized, blurred?

Issues: The worldwide nature of the Internet has already led to many issues which need of policies to resolve them. For example, if sexually explicit materials are provided on a web site in a culture in which they are permitted, and then they are accessed by someone in a different culture where such materials are outlawed as "obscene," then, whose laws and values apply? Should the "offending" person in the first culture be extradited to the second culture and prosecuted as a purveyor of pornography? Should the values of the first culture be permitted to undermine those of the second culture via the Internet?

Let us consider business transactions in cyberspace: Whose laws apply to business on the Internet? When people in one country purchase goods and services from merchants in another country, who should regulate or tax the transactions? And how will "cyber business" in a global market affect local business, local tax collections and local unemployment? What new laws, regulations, rules, practices should be adopted, and who should formulate them? What policies would be fair to all concerned?

And how will global cyber business affect the gap between rich nations and poor nations? Will that gap get even worse? Will ICT lead to a "new colonialism" in which the information-rich lord it over the information poor? Will economic and political rivalries emerge to threaten peace and security? What kinds of conflicts and misunderstandings might arise, and how should they be handled? – and by whom?

Or consider cyber medicine: medical advice and psychological counseling on the Internet, "keyhole" surgery conducted at a distance, medical tests and examinations over the net, "cyber prescriptions" for medicine written by doctors in one part of the world for patients in other parts of the world – these are just a few of the medical services and activities that already exist in cyberspace. How safe is cyber medicine? Who should regulate, license, control it?

Or consider education in cyberspace: hundreds of universities and colleges worldwide now offer educational credit for courses and modules. But when students earn university credits from all around the globe, who should set the standards? Who should award degrees and certify "graduates"? Will there be a "Cyber University of the World"? Will thousands of "ordinary" teachers be replaced by a handful of

"Internet-superstar teachers"? – or perhaps by teams of multimedia experts? – or even by educational software? Would such developments be wonderful new learning opportunities, or instead be educational disasters? What policies, rules, practices should be adopted and who should develop them?

At the social/political level of education, what will be the impact upon previously uneducated peoples of the world when they suddenly gain access to libraries, museums, newspapers, and other sources of knowledge? How will access to the world's great newspapers affect "closed" societies with no free press? Are democracy and human rights necessary consequences of an educated population with access to a free press? Will the Internet foster global democracy? – or will it become a tool for control and manipulation of the masses by a handful of powerful governments? – or powerful corporations?

Human Relationships: Of course, not all social/ethical issues which arise from ICT depend upon its global scope. Consider, for example, the impact of ICT on human relationships. How will family relationships or friendships be affected by mobile phones, palmtop and laptop computers, telecommuting to work and school, virtual-reality conferencing, cyber-sex? Will the efficiency and convenience of ICT lead to shorter work hours and more "quality time" with the family? – or will ICT create instead a more hectic and breathless lifestyle which separates family and friends from each other? Will people be isolated in front of a computer hour after hour, or will they find new friendships and relationships in "virtual communities" in cyberspace – relationships based upon interactions that never could occur in regular space-time settings? How fulfilling and "genuine" can such relationships be, and will they crowd out better, more satisfying face-to-face relationships? What does all this mean for a person's self-realization and satisfaction with life? What policies, laws, rules, practices should be put in place?

Social Justice: As more and more of society's activities and opportunities enter cyberspace – business opportunities, educational opportunities, medical services, employment, leisure-time activities, and on and on – it will become harder and harder for ICT "have-nots" to share in the benefits and opportunities of society. Persons without an "electronic identity" may have no socially recognised identity at all! Therefore social justice (not to mention economic prosperity) requires that society develop policies and practices to more fully include people who, in the past, have had limited access to ICT resources: women, the poor, the old, rural residents, persons with disabilities, even technophobes.

A good example is "assistive technology" for persons with disabilities. A variety of hardware and software has been developed in recent years to enable persons with disabilities to use ICT easily and effectively. As a result, people who would otherwise be utterly dependent upon others for almost everything suddenly find their lives transformed into happy, productive, "near-normal" ones. Visual impairments and blindness, hearing impairments and deafness, inability to control one's limbs, even near-total paralysis need no longer be major impediments to happiness and productivity. Given such dramatic benefits of assistive technology, as well as rapidly decreasing costs, does a just society have an ethical obligation to provide assistive technology to its citizens with disabilities?

Work: Work and the workplace are being dramatically transformed by ICT. More flexibility and choices are possible (e.g., tele-working at home, on the road, at any hour or location). In addition, new kinds of jobs and job opportunities are being created (e.g., webmasters, data miners, cyber-counselors, and so on). But such benefits and opportunities are accompanied by risks and problems, like unemployment of computer-replaced humans, "deskilling" of workers who only push buttons, stress keeping up with high speed machines, repetitive motion injuries, magnetism and radiation from computer hardware, surveillance of workers by monitoring software, and ICT "sweat shops" that pay "slave wages." A wide range of new laws, regulations, rules and practices are needed if society is to manage these workplace developments efficiently and justly.

Government and Democracy: ICT has the potential to significantly change the relationship between individual citizens and governments – local, regional and national. Electronic voting and referenda, as well as e-mailed messages to legislators and ministers, could give citizens more opportunities to make timely input into government decisions and law making. Optimists point out that ICT, appropriately used, can enable better citizen participation in democratic processes, make government more open and accountable and provide easy citizen access to government information, reports, services, plans and proposed legislation. Pessimists, on the other hand, worry that government officials who are regularly bombarded with e-mail from angry voters might be easily swayed by short-term swings in public mood, that hackers could disrupt or corrupt electronic election processes, that dictatorial governments might find ways to use ICT to control and intimidate the population more effectively than ever before. What policies should be put in place to take account of these hopes and worries?

Intellectual Property and Ownership: In the information age, the "information rich" will run the world, and the "information poor" will be poor indeed! Possession and control of information will be the keys to wealth, power and success. Those who own and control the information infrastructure will be amongst the wealthiest and most powerful of all. And those who own digitized intellectual property – software, databases, music, video, literary works, and educational resources – will possess major economic assets. But digitized information is easily copied and altered, easily transferred across borders, and therefore the piracy of intellectual property will be a major social problem. Even today, for example, in some countries over ninety percent of the software is pirated – not to mention the music and video resources! What new laws, regulations, rules, international agreements and practices would be fair and just, and who should formulate or enforce them?

It is also possible to mix and combine several types of digitized resources to create "multimedia" works of various kinds. A single program, for example, might make use of bits and snippets of photographs, video clips, sound bites, graphic art, newsprint and excerpts from various literary works. How large must a component of such a work be before the user must pay copyright royalties? Must the creator of a multimedia work identify thousands of copyright holders and pay thousands of copyright fees in order to be allowed to create and disseminate his/her work? What should the rules be and who should enforce them? How can they be enforced at all on the new frontiers of cyberspace?

4.6 RESPONSIBILITY, ACCOUNTABILITY AND LIABILITY

In the Information Systems discipline, increasing attention is being paid to the issues of professional ethics. Ethical choices are decisions made by individuals who are responsible for the consequences of their actions. Key elements include:

- **Responsibility:** An individual accepting the potential costs, duties, and obligations for decisions they make. May require social norms and laws to enable.
- **Accountability:** Mechanisms in social institutions to determine who is responsible and assessing responsibilities for decisions and actions.
- **Liability:** Political means to permit individuals to recover damages via due process. Due process insures laws are applied properly and laws are known and understood, with an ability to appeal to higher authorities.

Responsibility by software users expected by the software developers' is primarily the protection, or violation of that protection, of software programs. Issues relating to the copying of software programs and protection by copyright laws are discussed in detail in unit 4.8. Software users or consumers on the other hand may claim that they have the right to use a product for which they have paid, and indeed have the right to expect **Responsibility by the software vendors** that that product will be free of defects (bugs). This imposes a duty of quality (and professionalism) on the developers of the software to ensure that the software is indeed bug-free. Consumers expect that a product be competitively priced, providing value for money.

Professional **accountability** is an issue that is closely tied to many codes of ethical conduct. As per ethical code of conduct it is expected that members shall accept professional responsibility for their work and for the work of their subordinates and associates under their direction, and shall not terminate any assignment except for good reason and on reasonable notice. Members are expected to be accountable for the quality, timeliness and use of resources in the work for which he/she is responsible. In general, accountability lies at the root of vendor-client relationships, and is therefore relevant to both the professionals (from developers as well as from users side). Accountability is important because it shows that high-quality work is valued, encourages professionals to be diligent and responsible in their practice, and establishes just foundations for **Liabilities** and/or compensation when software does not perform according to expectations, or when professional advice turns out to be unreliable. Accountability is also important because computer software is used throughout our society, and is an essential component of many life-critical systems, such as transportation equipment (aircraft, trains, lifts), medical devices, toys, accounting and financial control systems (ATMs), weapons systems, communications devices (radar, telephones, televisions, satellites, networks), and domestic appliances (microwave ovens, TVs, refrigerators, air-conditioning systems).

Through encouraging a strong sense of professional accountability, we can attempt to ensure that those who are responsible for the safe functioning of these systems will do their utmost to ensure that systems are safe, and will minimize risks. Accountability runs a considerable risk of being eroded, however, when computers are made scapegoats for human failings or when developers of computer software deny any responsibility for the consequences of use of the software, even when this use is in accordance with the purpose for which the software was designed. Let us look at a scenario relating to accountability dilemma of this type. A computerized investment system was designed for and purchased by a pension fund management company. The user of the system became familiar with it, and requested IT staff (not the original designer) to make some modifications to the system. Shortly afterwards, substantial losses were incurred and payments to pensioners had to be cut. Who is accountable? The original system designer? The user who requested modifications? It is perhaps all too easy to blame the computer, apologize, and do nothing.

Accountability is generally assumed to include a number of components, viz.: responsibility (direct or indirect) and liability. Liability relates to who should pay compensation (financial redress, community service,…) as a result of being held responsible for an action. In some situations, liability may apply, i.e., requiring the payment of compensation to a victim even though the harm has not arisen through one's deliberate or direct actions. For example take an aircraft systems, if an aircraft crashes due to a system failure, then the airline is subject to liability even though the airline has not deliberately or directly caused the crash. Such cases of liability help to ensure that extraordinary care is taken over the development and maintenance of systems that have the potential to cause loss of life.

Although the definition of accountability is fairly straightforward, four barriers to accountability can be identified: the problem of too many hands; the computer as scapegoat; the problem of bugs; and ownership without liability. Computer software is especially vulnerable to the problem of too many hands, because most (if not all) software is necessarily designed and developed by a number of individuals, often at different points in time. Furthermore, software often has a symbiotic relationship with computer hardware. This makes it very difficult to identify precisely which person should take responsibility for any unexpected action. However, such complexity can be no defense and there is a clear need to attempt to identify who should take responsibility for the problem. If we do not attempt to apportion blame, not only will the responsible person(s) escape blame, but they may cause further problems to happen in the future. The net result is that accountability is eroded, with no one prepared to step forwards and take responsibility.

Information systems are often blamed for human errors because they intermediate communications between people. If a human action is mediated by a computer, there is a strong tendency to blame the computer rather than the human (designer, programmer or user) that caused the computer to produce incorrect information. With the increased use of computers, computers will be made scapegoats for human failings with increasing frequency. In this situation, it is vital to establish lines of responsibility because it is all too easy for humans to shirk their responsibilities.

Bugs include all types of software errors, including those made at the design, modeling and coding stages of system design. Bugs certainly make software unreliable and can cause system failure, with the potential for loss of life or severe damages. There has been an unfortunate tendency for bugs to be seen as an inevitable aspect of computer systems, even as natural hazards that computer users have come to accept. This view is not restricted to the software developers, with prominent commentators on IT ethics voicing similar views, asserting “It is the nature of software programs to have errors…”. However, the very purpose of professional accountability is that we should identify who has caused a harm- whether intentionally or through negligence. If we accept that bugs are inevitable, then accountability becomes impossible - we can merely regret that harm was caused, but defend ourselves by saying that bugs are unavoidable (even expected) and therefore no one should be held responsible for the harm. There may even be resistance to liability — if no one can be identified as accountable, then why should anyone pay compensation - which is precisely why the concept of liability is so important. If, however, we do not view bugs as natural hazards, but as manifestations of unprofessional and sloppy work, we should be able to identify lines of responsibility, particularly for persistent bugs. Furthermore, if we are to act as true professionals, we cannot be satisfied with the notion that bugs are inevitable -it is like saying that the loss of human life through human error is inevitable, and that when we turn on a TV set, there is a reasonable chance that it will short circuit and electrocute us. Society has the right to expect that domestic appliances, and many other essential systems, will function safely.

As we have mentioned previously, the legal aspects of software product reliability are complex. Nevertheless, in order to understand the relationship between bugs and liability, it is instructive to introduce the legal rights and duties of developers and customers. *Strict* liability is generally applied by courts when a person or property is injured or damaged. Thus, purely economic damages are usually not put to Strict Liability. A second category of liability is known as negligence. Developers can avoid accusations of negligence by ensuring that they take reasonable care in the design, coding and testing of their products. One problem here relates to the thoroughness of testing. If a company has followed industry standards with regard to testing, then it would appear that if bugs still exist, it cannot be accused of including such bugs either deliberately or through carelessness. Whilst this does not obviate the requirement for software to be bug-free, it certainly does imply that industry standards may need to be set at very high levels. A third liability category is known as breach of warranty. A warranty is essentially a promise that the developer makes to the customer with regard to the functionality of the software, and forms “part of the contractual agreement between the seller and the buyer.

Having identified these categories of liability, it is important to note that pre-packaged software (Microsoft Word, Netscape Navigator, etc.) are generally recognised to be *products*, but custom-developed applications are considered to be *services*. This distinction is critical since while the standards of liability are applicable to products, they are not to services. Individually customized software must therefore be legally covered by the specific contract that is agreed upon between the developer and the customer, where penalties for non-functionality, lateness of delivery, etc. may be specified.

Computer software developers affirm that they sell a user the licence to install and use (typically) a single copy of a software package; they are not selling the ownership of the software. However, at the same time, software developers employ disclaimers to minimise as far as possible any liability (e.g., for financial or data losses) arising out of the customer's use of the software. Indeed, we note an unfortunate tendency for software producers to deny to the maximum extent possible any responsibility for actions caused by their software. *Same time, consumers are held to be liable for any use of the software that lies outside the narrowly-worded terms of the software license agreement.* This situation has the effect of eroding the rights of the user, since virtually all the risks of using the software (but few of the rights) are transferred to the user. Legally, these disclaimers have been recognised in courts so long as they are explicit and prominently displayed. There is evidence to indicate that the tendency to disclaim liability is growing more serious, noting that many software companies intend to implement measures that would have the effect of further diminishing consumers' rights.

Another consequence of minimizing liability is the software developers' parallel denial of responsibility for any bugs that they may include (intentionally or inadvertently) in the software. Essentially, when you buy software, you install and use it as is, i.e., at your own risk. We argue, however, that such transfer of risk is unreasonable because it imposes upon the developer no duty to ensure that software is bug-free, nor even - so long as these bugs do not cause loss of life or injury - to provide bug-fixes when they are identified. This seems to be both unethical and unprofessional — consumers have the right to use a product that fulfils the agreement with the vendor — explicitly or implicitly. At the same time, developers have a moral duty to ensure that the software they sell is usable and "fulfils the explicit and implicit contract between the buyer and seller. We maintain that if software developers wish to retain their ownership rights, then they should be both responsible and liable for their products, since they are in the best position (owning source code) to have direct control over the quality of their software.

We suggest that accountability and liability to compensate need to be separate. An individual programmer or software designer may be responsible for harm, but liability more properly lies with the employer, since it retains responsibility/ownership for the work of its employees. There is a strong need to clarify and promote standards of care in system design that are acceptable to users and developers alike — perhaps via a code of practice. Furthermore, the practice of extensive disclaims needs to be reviewed. Customers have the right to be informed if there are known bugs, irrespective of whether the developer intends to fix them, and irrespective of whether the developer thinks they are significant or not. Not informing the customer amounts to misrepresentation. Indeed, misrepresentation can be a form of contract violation and so may potentially attract legal penalties of a different kind. With respect to bugs, appropriate standards of testing need to be promulgated and adhered to, while excellent documentation of "who does what" should enable lines of accountability to be established. Independent software auditors may be called upon to verify software quality, if possible applying ISO standards.

Accountability is clearly vital not only for the information systems profession, but also for us as professionals, if we are to be held in the highest regard by those for whom we develop systems.

4.7 INFORMATION RIGHT AND ACTS

With respect to **Privacy and Freedom** in an Information Society there have been some attempts to regulate the collection and use of information about individuals. This aspect has already been covered in this unit. The information right and act are discussed in the section, so that as a manager, you will be able implement there in better way, however, the details given in this section is according to the initial Right of Information (2005) for updated details. You must list the official website of government of India.

RIGHT TO INFORMATION ACT: The Government of India in the year 2005 has enacted the Right to Information Act" (available at http://www.persmin.nic.in/RTI/WelcomeRTI.htm) to provide for setting out the practical regime of right to information for citizens to secure access to information under the control of Public Authorities in order to promote transparency and accountability in the working of any public authority. The Act is presented below:

ABOUT RIGHT TO INFORMATION

When does it come into force? It came into force on 12th October, 2005 (120th day of its enactment on 15th June, 2005). Some provisions have come into force with immediate effect viz. obligations of public authorities [S.4(1)], designation of Public Information Officers and Assistant Public Information Officers[S.5(1) and 5(2)], constitution of Central Information Commission (S.12 and 13), constitution of State Information Commission (S.15 and 16), non-applicability of the Act to Intelligence and Security Organizations (S.24) and power to make rules to carry out the provisions of the Act (S.27 and 28).

Who is covered? The Act extends to the whole of India except the State of Jammu and Kashmir. [S 12)].

What does 'information' mean? Information means any material in any form including records, documents, memos, e-mails, opinions, advice, press releases, circulars, orders, logbooks, contracts, reports, papers, samples, models, data material held in any electronic form and information relating to any private body which can be accessed by a public authority under any other law for the time being in force but does not include file noting [S.2(f)].

What does Right to Information mean? It includes the right to

1) Inspect works, documents, and records.
2) Take notes, extracts or certified copies of documents or records.
3) Take certified samples of material.
4) Obtain information in the form of printouts, diskettes, floppies, tapes, video cassettes or in any other electronic mode or through printouts.[S.2(j)]

OFFICERS AND THEIR OBLIGATIONS

What are the obligations of public authority?: It shall publish within one hundred and twenty days of the enactment:

i) the particulars of its organisation, functions and duties;
ii) the powers and duties of its officers and employees;
iii) the procedure followed in its decision making process, including channels of supervision and accountability;
iv) the norms set by it for the discharge of its functions;

v) the rules, regulations, instructions, manuals and records used by its employees for discharging its functions;

vi) a statement of the categories of the documents held by it or under its control;

vii) the particulars of any arrangement that exists for consultation with, or representation by the members of the public, in relation to the formulation of policy or implementation thereof;

viii) a statement of the boards, councils, committees and other bodies consisting of two or more persons constituted by it. Additionally, information as to whether the meetings of these are open to the public, or the minutes' of such meetings are accessible to the public;

ix) a directory of its officers and employees;

x) the monthly remuneration received by each of its officers and employees, including the system of compensation as provided in its regulations;

xi) the budget allocated to each of its agency, indicating the particulars of all plans, proposed expenditures and reports on disbursements made;

xii) the manner of execution of subsidy programmes, including the amounts allocated and the details and beneficiaries of such programmes;

xiii) particulars of recipients of concessions, permits or authorizations granted by it;

xiv) details of the information available to, or held by it, reduced in an electronic form;

xv) the particulars of facilities available to citizens for obtaining information, including the working hours of a library or reading room, if maintained for public use;

xvi) the names, designations and other particulars of the Public Information Officers.[S.4(1)(b)].

What does a public authority mean? It means any authority or body or institution of self-government established or constituted: [S.2(h)]

- by or under the Constitution;
- by any other law made by Parliament;
- by any other law made by State Legislature;
- by notification issued or order made by the appropriate Government and includes any-
  - (a) body owned, controlled or substantially financed
  - (b) non-Government organization substantially financed directly or indirectly by the appropriate Government

.

Who are Public Information Officers (PIOs)? PIOs are officers designated by the public authorities in all administrative units or offices under it to provide information to the citizens requesting for information under the Act. Any officer, whose assistance has been sought by the PIO for the proper discharge of his or her duties, shall render all assistance and for the purpose of contraventions of the provisions of this Act, such other officer shall be treated as a PIO.

What are the duties of a PIO?

- PIO shall deal with requests from persons seeking information and where the request cannot be made in writing, render reasonable assistance to the person to reduce the same in writing.

- If the information requested for is held by or its subject matter is closely connected with the function of another public authority, the PIO shall transfer, within 5 days, the request to that other public authority and inform the applicant immediately.
- PIO may seek the assistance of any other officer for the proper discharge of his/her duties.
- PIO, on receipt of a request, shall as expeditiously as possible, and in any case within 30 days of the receipt of the request, either provide the information on payment of such fee as may be prescribed or reject the request for any of the reasons specified in S.8 or S.9.
- Where the information requested for concerns the life or liberty of a person, the same shall be provided within forty-eight hours of the receipt of the request.
- If the PIO fails to give a decision on the request within the period specified, he/she shall be deemed to have refused the request.
- Where a request has been rejected, the PIO shall communicate to the person making the requeste — (i) the reasons for such rejection, (ii) the period within which an appeal against such rejection may be preferred, and (iii) the particulars of the Appellate Authority.
- PIO shall provide information in the form in which it is sought unless it would disproportionately divert the resources of the Public Authority or would be detrimental to the safety or preservation of the record in question.
- If allowing partial access, the PIO shall give a notice to the applicant, informing:
    (a) that only part of the record requested, after severance of the record containing information which is exempt from disclosure, is being provided;

    (b) the reasons for the decision, including any findings on any material question of fact, referring to the material on which those findings were based;

    (c) the name and designation of the person giving the decision;

    (d) the details of the fees calculated by him or her and the amount of fee which the applicant is required to deposit; and

    (e) his or her rights with respect to review of the decision regarding non-disclosure of part of the information, the amount of fee charged or the form of access provided.
- If information sought has been supplied by a third party or is treated as confidential by that third party, the PIO shall give a written notice to the third party within 5 days from the receipt of the request and take its representation into consideration.
- Third party must be given a chance to make a representation before the PIO within 10 days from the date of receipt of such notice.

WHAT INFORMATION IS AVAILABLE?

What is not open to disclosure? The following is exempt from disclosure [S.8)]

1) Information, disclosure of which would prejudicially affect the sovereignty and integrity of India, the security, strategic, scientific or economic interests of the State, relation with foreign State or lead to incitement of an offence.
2) Information which has been expressly forbidden to be published by any court of law or tribunal or the disclosure of which may constitute contempt of court;

3) Information, the disclosure of which would cause a breach of privilege of Parliament or the State Legislature;

4) Information including commercial confidence, trade secrets or intellectual property, the disclosure of which would harm the competitive position of a third party, unless the competent authority is satisfied that larger public interest warrants the disclosure of such information;

5) Information available to a person in his/her fiduciary relationship, unless the competent authority is satisfied that the larger public interest warrants the disclosure of such information;

6) Information received in confidence from foreign Government;

7) Information, the disclosure of which would endanger the life or physical safety of any person or identify the source of information or assistance given in confidence for law enforcement or security purposes;

8) Information which would impede the process of investigation or apprehension or prosecution of offenders;

9) Cabinet papers including records of deliberations of the Council of Ministers, Secretaries and other officers;

10) Information which relates to personal information the disclosure of which has no relationship to any public activity or interest, or which would cause unwarranted invasion of the privacy of the individual;

11) Notwithstanding any of the exemptions listed above, a public authority may allow access to information, if public interest in disclosure outweighs the harm to the protected interests.

Is partial disclosure allowed? Only that part of the record which does not contain any information which is exempt from disclosure and which can reasonably be severed from any part that contains exempt information, may be provided. [S.10].

Procedure for requesting information

1) Apply in writing or through electronic means in English or Hindi or in the official language of the area, to the PIO, specifying the particulars of the information sought for.

2) Reasons for seeking information are not required to be given;

3) Pay fees as may be prescribed (if not belonging to the "below poverty line" category).

What is the time limit to get the information?

1) 30 days from the date of application.

2) 48 hours for information concerning the life and liberty of a person

3) 5 days shall be added to the above response time, in case the application for information is given to the Assistant Public Information Officer.

4) If the interests of a third party are involved then time limit will be 40 days (maximum period + time given to the party to make representation).

5) Failure to provide information within the specified period is a deemed refusal.

4.8 INTELLECTUAL PROPERTY AND RIGHTS

The copying of software programs, although nominally protected by copyright laws, is certainly widespread. While some may acknowledge that such copying is tantamount to theft, the activity persists if only because it is so easy, the chance of getting caught is considered negligible, and the software developers are perceived as being rich enough already. Such copying is not restricted to personal users – businesses are involved as well, though often inadvertently. It is not uncommon to notice that employees contribute significantly to the presence of illegal software in the workplace, posing serious financial and legal consequences for their employers. Among those [companies] surveyed, software decision-makers indicate that colleagues bringing software from home (40%), downloading unauthorized copies from the Internet (24%), and sharing programs with other employees (24%) are three of the most common forms of violation occurring in their companies.

The philosophical basis for software protection lies in the *prima facie* right to private property, particularly property that can be said to be the 'fruit of one's endeavors'. These views are not accepted by all nations with the same gravity. In Chinese society, for instance, the "socialization process emphasizes obligations and duties that promote conformity, collective solidarity, and obedience while downplaying assertiveness and creativity". The similarity between a "preoccupation with social order" in Chinese society and a "preoccupation with individual freedom" in Western societies is a point to be noted. These fundamental cultural and social differences certainly raise difficulties in legislative attempts to provide for universal protection of creativity.

A danger inherent in copyright protection is that when a technology is wholly owned by a single entity (individual, organisation), consumers may be harmed because the opportunity for competition is much diminished. Monopolies can lead to reduced evolution and diffusion of products, as well as overpricing and underproduction. Given these opposing forces, there clearly needs to be a reasonable balance between protection of a product on the one hand, and the right of consumers to avail themselves of the product at reasonable cost on the other. Indeed, in Korea and Japan there is a public assumption that new ideas and technologies should be shared in the public domain so that members of a society can benefit.

In many developing countries, meanwhile, governments are, quite naturally, more concerned that new technology should spread through all of a society as rapidly as possible, enabling the country to leapfrog older generations of technology and catch up with the rest of the world. The notion that technology should in some way be strongly protected, with profits going overseas, is not one that they feel is good for the development of the local economy. In such contexts, much of the argument about INTELLECTUAL PROPERTY AND RIGHTS (IPR) lies in the principles between rights and duties. Software producers claim that they have the right to protect the fruit of their endeavors — the software programs. Furthermore, they have the right to be compensated for the resources that they have expended in the development of that product. This right is translated into a right to charge consumers what they deem a fair price for the software products — a price that covers the various developmental costs, as well as generating profits that can be used for future product research and development. To protect their right to the protect fruit of their endeavors, they claim that consumers have a duty both to pay the price and to respect the intellectual property contained within the product — by not stealing it.

The notion of ownership of something, whether it has a physical form or not, does still make sense as intellectual property. There are a number of laws and agreements throughout the world to protect intellectual property rights. The right to copy or duplicate materials can be granted only by the owners of the information. This is called the copyright. Many documents on the Internet contain a statement that asserts that the document is copyrighted and gives permission for distributing the document in an electronic form, provided it isn't sold or made part of some commercial venture. Even items that don't contain these statements are protected by the copyright laws of the United States, the Universal Copyright Convention, or the Berne Union. Most of the copyright conventions or statutes include a provision so that individuals may make copies of portions of a document for short-term use. If information is obtainable on the Internet, and there is no charge to access the information, it can often be shared in an electronic form. That certainly doesn't mean you can copy images or documents and make them available on the Internet, or make copies and share them in a printed form with others. Quite naturally, many of the folks who create or work at providing material available on the Internet expect to get credit and be paid for their work.

Copyrights

Challenge by Electronic Information Systems : The fluidity of information on the networks has caused some confusion about how copyrights and intellectual property rights apply to electronic files. In the relatively small world of the original network users, an emphasis on free exchange of information and a common understanding of intellectual property allayed most potential conflicts over use of information. Now, as the networks grow larger and attract a broader range of people, some clarification of how electronic files may be used is becoming necessary. The ease with which electronic files can be distributed and the nature of some electronic information create problems within existing copyright law: either the law does not address the peculiarities of electronic information or the law is too easily subverted by the ease with which files can be copied and transferred. Similar problems have arisen with photocopy machines, VCRs, and tape recorders. To make matters more complex, other countries may have different copyright laws, so information made available globally through a network may not have the same protection in other places.

The basic existing copyright principles should keep most network users on ethical grounds.

- Copyrights protect original works of authorship, including literary, musical, dramatic, graphic, audiovisual, and architectural works, and sound recordings.
- The law forbids unauthorised reproduction, distribution, performance, or display of works with copyrights. The general intent of the law is to protect the commercial value of a work.
- Having a copy of a work with a copyright does not mean that the holder also has the right to distribute, reproduce, perform, or display it.
- Copyrights apply to both published and unpublished work. Under the international Berne Convention on copyrights, which the U.S. signed in 1989, a copyright comes into effect from the moment a work is created and is fixed in some form of tangible expression.
- A copyright notice is not required for copyright protection. The only way a copyright can be invalidated is by explicit announcement by the author that copyright protections are waived.
- Copyrights do not apply to titles, short phrases, names, slogans, mere listing of ingredients, or works consisting entirely of unoriginal information (such as standard calendars).
- Copyrights do not extend to ideas, procedures, methods, systems, concepts, principles, discoveries, or devices; these must be patented for protection.
- Remember, Complete international copyright protection does not exist. Works are subject to the laws of individual nations, although most nations have signed international agreements on copyrights.

Law for Work *Created* on a Network: The principles of copyright laws apply easily to work not created in an electronic file. But what about original work that is created within a network? The law applies in sometimes surprising ways, and users should think about copyrights before distributing or reproducing work created by another person. For instance: E-mail.

E-mail is protected by copyright. Information received in e-mail may be discussed, but the specific contents of e-mail have copyright protection.

Usenet postings may also be protected. These may be read and discussed by however, many people have access to the Usenet, but they cannot be reproduced and distributed in any way that may diminish the author's ability to profit from the original work — however farfetched such profit may seem. There is an interesting question concerning network postings, does the fact that anything you say in an on-line system can be downloaded and printed out by anyone who happens to read it create a different class of reproduction than quoting without permission from a commercial publication? If a journalist quotes something from an on-line system and does not obtain permission, did s/he steal it, or overhear it in a conversation? In such cases it can be concluded that whatever seems like fair use probably is, but that actual control of such use is impossible and that good manners are critically important.

Computer programs, which might appear to be ideas, procedures, systems, or devices, may be registered as literary works under the law, and therefore, receive copyright protection.

Check Your Progress 1

1) **State whether True or False**

(a) Everything on the Web is considered to be protected under copyright and intellectual property laws unless the Web site specifically states that the content is public domain.

True ☐ False ☐

(b) As per the data available, unauthorized data access is increasing day by day.

True ☐ False ☐

(c) The changing of data going into or out of a computer, for example, a student breaking into his university's grade system to manipulate his grade is known as Phreaking.

True ☐ False ☐

(d) Cloning refers to the practice of stealing credit card numbers online, to be resold or used to charge merchandise against victim's account.

True ☐ False ☐

(e) Viruses are the Destructive Codes that Replicate and Worms are the Destructive Codes that do not Replicate.

True ☐ False ☐

2) (a) What are the five moral dimensions an established organisation and its managers should recognise?

4.9 SUMMARY

In this unit social, ethical and moral aspects were discussed. This unit also covered what possible threats can be there from unknown sources in the form of malicious software or other cheating techniques relating to information systems so that necessary precautions can be taken to avoid these threats. Discussions also covered what are the acts relating to information rights and the Intellectual property rights.

Whether a person is a software developer or a software user, what are their responsibilities, accountabilities and obligations. This issue has also been covered here to make you ready for the industry as a responsible professional.

Since developments and changes relating to Information Systems are quite rapid, it is advisable to keep studying the professional subjects covered here through reading material as well as through the net.

4.10 SOLUTIONS / ANSWERS

Check Your Progress 1

1) (a) True, (b) False, (c) false, (d) False, (e) False,

2) (a) The five moral dimensions an established organization and its managers should recognise are:

- The information rights to privacy and freedom
- The property rights to individual ideas and efforts
- The accountability, liability and control issues involved in using technology
- The system quality requirements of businesses and individuals
- The quality of life impact of technology.

4.11 FURTHER READINGS

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