Table 8.1
ERP failure cases

Organization	ERP Package	Results
HP	SAP	ERP implementation failed. Financial loss of USD 160 million (more than five times the cost of implementation of ERP), and severe back logs
FoxMeyer	SAP	ERP implementation failed, leading to bankruptcy after implementing SAP
Hershey Foods Corp.	IBM-led SAP	Fall in sales by 12% after spending USD 112 million on ERP implementation

Several such implementation failures resulted in huge losses to the respective organizations. To counter such ERP implementation failures, various ERP implementation methods have been proposed in the past, Which would try to mitigate the failure rate of ERP systems, or implement the ERP system more efficiently. Unfortunately, they do not seem to work very well. What are the major factors causing this problem? A proper understanding of all such factors will definitely help in reducing ERP implementation failure.

8.1 Risk/Failure Factors in ERP Implementation

Researchers have tried to identify the various risk and failure factors associated with ERP implementation. According to Majed (2003), considering ERP implementation an IT project is one of the major risk factors. Research has detailed that there is an obvious difference between ERP projects and software projects. Software projects are used to develop a software system, but an ERP project is composed of software projects and business processes. Moreover, ERP systems consist of tightly-linked interdependencies of business processes, software systems, and process re-engineering (*Wright & Wright, 2001*). This presents unique risk factors associated with the software systems and their wide applications. Boehm (1991) identified ten software development risk factors:

- Personnel shortfall for implementation
- Unrealistic schedule
- Unrealistic budget

- Developing the wrong software functions
- Developing the wrong graphical user interface
- Ongoing change in requirements
- Shortfall in externally-furnished components
- Shortfall in externally-performed tasks
- Real-time performance shortfall
- Lack of IT capabilities

Some additional software development risk factors include:

- Technological complexity
- Degree of novelty, or structure of project
- Technological change
- Challenging project size

ERP projects are unique in that they require the intense collaboration of groups of stakeholders, namely, IS staff, end users, and management. Hence, ERP projects are organization-oriented activities, and, therefore, subject to all the vagaries of group dynamics, interactions, coordination, and communication. According to Huang et al. (2004), the various risk factors in ERP implementation can be divided into the following categories: organization fit, skill mix, project management and control, software system design, user involvement and training, and technology planning. Table 8.2 gives the various ERP implementation risk factors under these categories.

Grossman and Walsh (2004) also attempted to highlight some of the risk factors with ERP implementation. They divided various risk factors into three categories: technical, operational, and legal. The details are given below:

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Some of the technical and operational risk factors are listed below -

- Proper time to install ERP systems
- Failure to check the cost of package and organizational efficiencies
- Lack of communication between the implementation teams and the third-party consultants
- Lack of team spirit among the members of the implementation teams
- Lack of commitment on the vendor's part
- Lack of detailed specifications of the system

- Lack of collaborative infrastructure design to support the system
- Lack of specific tools to convert the legacy data into the new system
- Lack of **stress testing**
- Lack of proper means to train the potential users of ERP systems

***Stress Testing:** It is a form of testing that is used to determine the stability of a given system or entity. It involves testing beyond the normal operational capacity, often to breaking point, in order to observe the results.*

Some legal issues involved are as follows:

- Pitfalls in integrated contracts with vendors, consultants, and the implementation team
- Inclusion of detailed specifications
- Limitation of liability clauses
- Arbitration vs. litigation issues
- Payment issues with vendors and consultants
- Confusion over modification of the ERP package

Similarly, a number of theories in the past also dwelt on the risks encountered during the implementation of an ERP system. A detailed discussion on these risks, as given below, is absolutely crucial in understanding their repercussions, and to plan the implementation of the ERP system accordingly.

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- **Poor leadership and lack of top management's commitment:** Kansal (2006) emphasized that poor leadership from the top management is one of the most critical risk factors. If the top management is not strongly committed to the system, or does not foresee and plan for the profound changes necessitated by ERP, or does not actively participate in the implementation, the implementation has inevitably high chances of failure. The implementation of ERP must be viewed by the top management as a transformation in the ways the organization conducts its business. It is important to achieve the support of the top management in accomplishing the project objectives, and aligning these goals with the strategic business goals (*Mary Sumner, 2000*). Moreover, the support of the top management in terms of project advocacy and provision of adequate resources is also extremely important (*Parr & Shanks, 2000*).

- **Unrealistic user expectation:** Holsapple (2005) emphasized that unrealistic expectations from the ERP systems also cause problems in its implementation and execution. Many companies underestimate the quantum of resources, time, and outside assistance required to implement and run the new system. Moreover, managers and workers frequently assume that the performance of the company will begin to improve immediately post implementation. Because the new system is complex and difficult to master, organizations must be prepared for an initial decline in productivity immediately after the new software is put into operation. As familiarity with the new system increases, the expected improvements and benefits will follow.
- **Inadequate control of system**: Zhe et al. (2005) emphasized that a lack of adequate control by ERP systems at the initial level is a risk factor in ERP implementation. A poorly-designed ERP system does not adequately mirror the required processes. This means that the ERP systems, by design, do not provide the information needed to execute a task. Some major implementation failures of ERP systems occur because the new software's needs and capabilities are not in sync with the organization's existing business processes and procedures (*Dane Caruso*, 2005). An ERP system that is not designed to meet the specific business needs of the company can cause tremendous problems. A significant mismatch between the technological imperatives of the system and the existing structure, processes, or business needs of the organization can generate widespread chaos.
- **Lack of project management structure and methodologies:** Sumner (2005) emphasized that with the lack of a proper management structure and central project leadership, there can be excessive duplication of efforts. Managers are often surprised by the scope, size, and complexity of an ERP implementation. As a result, the management does not initiates the necessary level of detailed project management planning and control (*Ghosh & Ghosh, 2003*).
- **Insufficient user training:** Holsapple et al. (2005) emphasized that a number of organizations have realized the importance of investment in training and re-skilling the IT workforce. The strategy followed now by many organizations is that of increasing the number of IT staff members geared with technical skills, particularly in application-specific modules. Top managers and all the

system users must be fully educated to understand the integration of ERP systems into the overall company operation (*Write & Write, 2002*). All users must be trained to take full advantage of the system's capabilities. Any failure in educating and training all the relevant personnel leads to hiccups in the implementation process. Without adequate training, a system can neither be used properly, nor ever achieve the returns that had been projected (*Grossman & Walsh, 2004*). A lesson learnt from the past is that insufficient end-user training can generate resistance to using the system, largely because people are ill-prepared, and, therefore, also reluctant to use it effectively.

- **Ineffective communication of project objectives:** Lee et al. (2005) emphasized that ineffectively communicated project objectives lead to disasters as organization frequently tend to lose their direction half-way through implementation. According to them, it is also critical to comprehensibly communicate the activities involved, including the scope and objectives of the ERP project. Proper communication and organization of the project are critical, as is managing people with strong administrative skills. At the start of the ERP project, organizations are not aware of the scope of the implementation and its impact. In such a case, incomplete communication leads to the loss of enthusiasm in understanding the application and its usage.
- **Lack of user participation**: Researchers have emphasized that the non-involvement of users is another major implementation risk. It may expose the firm to significant risks of unintentional errors and inefficiencies. According to Yang et al. (2006), the real problem is the lack of buy-in and support, and the manifestations of this problem include a lack of user involvement and training. Also, the inability to obtain the full-time commitment of customers towards project management and activities compounds the risk. It may be difficult to get managers to stay committed to their respective roles. Once back to their functional areas, managers might be uncertain about their responsibilities. Furthermore, in light of people's natural tendency to be comfortable with status quo, users may be fearful of the changes that any new system would inevitably bring, especially one as pervasive as an ERP system (*Ghosh & Ghosh, 2003*). People fear that the new system will make their jobs more difficult, or reduce their importance, or even cost them their jobs in the eventuality that they are unable to use the ERP system as efficiently as they used the old system.

- **Lack of required skill-set and skill-mix**: Huang et al. (2004) emphasized that the management of organizations must understand and appreciate the criticality of high-tech worker turnover, recruitment, and their retention issues. One of the critical workforce requirements of an ERP project is the ability to obtain analysts both with business and technology knowledge (*Huang et al., 2004*). Instead of 200 programmers with average skills, the systems can be best implemented with 20 business analysts who have specialized expertise, the ability to learn quickly, and effective communication skills. Using a blend of consultants and internal staff to work on a project team enables the internal staff members to optimise their technical skills for ERP systems.
- **Lack of software design standards:** Dalal et al. (2004) emphasized that there are certain specifications laid down by ERP systems that organizations fail in following. The lack of an integrated technological strategy for supporting client–server implementation causes further risks and bottlenecks in the project's success. Different technological environments within an organization create delays in establishing consistency and coordination among platforms such as the **database management system (DBMS)**, and **operating system (OS)** environments. Technological bottlenecks can occur when designers try to establish bridges between ERP modules and legacy applications. Andrews et al. (2002), in their research, had found that every ERP implementation would encounter certain unavoidable problems. These problems include bugs in the software, problems related to the interfacing with existing systems, and hardware difficulties, etc. However, if the technical problems go unresolved or are managed improperly, they can cause the implementation to collapse. Technological bottlenecks can also be viewed in terms of data conversion from the legacy system to the new implementation (*Al- Mashari, 2003*). Due to fixed deadlines, there is no time to train the end-users. Consequently, at the end of the day, there are lots of end-users struggling to use the system and making all

***Database Management System (DBMS):** This is a computer software designed for the purpose of managing databases.*

***Operating System (OS):** It is software that manages the sharing of the resources of a computer, and provides programmers with an interface that is used to access those resources.*

kinds of data errors. If data is not running smoothly through the system, it could eventually impact financial statement results, and ultimately lead to improper reporting.

- **Business process re-engineering:** Wright and Wright (2002) emphasized that changing the business process from legacy systems to new systems is the biggest challenge for ERP vendors and organizations. Organizations adopt new packages, most of which have pre-defined processes and structures that may be very different from the old structures (*Daniel E'O Leary, 2002*). It is rare for some kind of at least minimal re-engineering to not take place in the organization. Re-engineering is a part of virtually all ERP implementations. If experts do not expect that process re-engineering may be required, it should compel the organization to question their expertise. Since the additional implementation of BPR compounds the complexity of implementing ERP, the failure to redesign business processes to fit the software is a critical risk factor. All project managers are taught to avoid customization. Companies try to implement BPR by adopting all kinds of methods to meet the requirements of their business processes. But this only leads to cost overruns and project failure. Rather than attempting to modify the software, the organizations should re-engineer its business processes in order to be consistent with the software. This re-engineering of business processes proves to be critical for the project's success. According to Park and Kusiak (2005), process re-engineering and the customization of ERP systems is done to achieve the desired business functionality, which leads to the heightened risks of potential financial statement misstatements, misclassifications, and defalcations. According to Zhe et al. (2005), a typical ERP system is installed as the replacement of a legacy system. In some cases it has been seen that re-engineering is done before ERP implementation. Such companies are successful since they have evidently gone through the process, and considered the ways of executing the process in order to fit the new system rather than tweaking the old business process. The kiss of death for a system is if the organization rejects the changes that the system requires (*Grossman & Walsh, 2004*).
- **System migration and control risks:** Yang et al. (2006), emphasized that ERP implementation faces a lot of problem with migration. Problems such as the time needed for implementation, technical problems with the new version, bad estimates by the migration partners, the cost involved, strain on the organization,

the quality of migration support systems, and additional risk factors, all contribute to complicate the process of data migration. Consequently, legacy data cannot always be converted to the new ERP system (*Grossman & Walsh, 2004*). Also, if legacy systems are not integrated, an organization might have data that represents multiple versions of the truth (data inconsistency). Data entered into an ERP system will be used uniformly throughout the organization due to process integration of the ERP systems. In such a case, if inaccurate data is entered into the common database, it may compromise the productivity of the organization (*Umble & Umble, 2002*). If the organization simply forges ahead with inaccurate data, under the assumption that data errors will be corrected when they are spotted, the ERP system will lose its credibility. This encourages people to ignore the new system and continue to run the organization on the basis of the old system. Now, talking about system and control risks, Kansal (2006) has separately identified system risks, control risks, security risks, and business risks. System and control risks reflect two types of control, i.e., systemic and social controls. Systemic control, i.e., systems risks, is built into the technology by the engineers and system designers. Social control, i.e., control risk, is embedded in the organization's policies and rules, its job descriptions, career ladders, and incentive schemes. Security risk relates to the improper access to equipments or the database.

- **Module-specific risks**: Wright and Wright (2002) emphasized that the risks created by a specific ERP module, i.e., applications, may also vary by area of expertise due to the varied historical origins of the major ERP vendors. For example, SAP started with standard inventory, material requirement planning, and manufacturing modules, later expanding include to financial accounting, payroll, and human resource management modules. It appears reasonable, for instance, that SAP's manufacturing modules are less prone to risks than SAP payroll and human resource. Risks may also differ by ERP vendors across applications, e.g., payroll versus supply-chain applications differ in risks using SAP, PeopleSoft, or Oracle. According to the author, the risks are more closely aligned with the company's business operations or specific packages rather than on the approach of an application being mandatory or discretely. In some of the new areas such as data warehousing, business intelligence, and data mining, people are not even aware of the risks.

These steps help in understanding the consequences of implementation risks and planning a safe implementation process. The next section describes some of the failed ERP implementation cases. The given organizations had tried implementing ERP systems by keeping all the important points in mind, but still left a lot of gaps that could not be filled.

8.2 Examples of ERP Failure

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[I] ERP Failure in Hershey's

Hershey's is a leading manufacturer of chocolates, confectionaries, and beverages in the United States of America. The company also manufactures sugar-free chocolates and products suiting the nutritional constraints of the customers. The company was started as a small entity by Milton S. Hershey in Pennsylvania, and has now become a big organization commanding a stake in the U.S. food market. They also play an important role in the international market.

The technical team at Hershey's had been working hard to implement ERP solutions for more than three years. They had chosen to implement SAP ERP. The process of ERP implementation was started during the period when Hershey's business was at its best. The company had chosen to implement ERP by using a popular method wherein the whole process was brought into action at a stretch. After ERP implementation, the business processes of the company faced major setbacks, leading to heavy losses in profits and market sales.

Hershey's was prompt in doing the things expected by an ERP solution buyer. They did not resort to any move that may disturb the plans of the vendor. They extended full cooperation to the vendor in every respect. There were no complaints from the vendor, or from the technical point of view.

There were, nonetheless, a number of reasons that led to the unexpected downfall of Hershey's. The basic reason for the debacle was choosing the wrong time for ERP implementation in the company. The company was more focused on commercial trade, while the energy and time spent on other activities was considerably low. During this period, the business prospects of the company were very promising. Companies, especially those that have been in business for a long span of time, cannot be expected to change their ways of conducting business or restructure at such a point of time. It is a period wherein competitors vie with each other to become the market leaders as well as defeat their rivals. In other words, the company has to concentrate on its core activities, which will directly, or indirectly, reflect on the income generated. In spite of knowing the risks involved, Hershey's blundered by not only changing and restructuring the business processes, but also by investing the considerable time and effort of the workers and the company in implementing ERP. This disrupted the normal functioning of the business, and created confusion and chaos in the company. Since the company's attention was fully diverted to ERP implementation, it was not able to rectify the uncertainties that emerged in the business as a result of the sudden ERP implementation.

The company compounded their mistake in implementing ERP at the wrong time. They also implemented many other enterprise applications such as CRM, thereby spoiling the business prospects. They realized that things were getting worse and not better with the simultaneous implementation of other enterprise applications. Ultimately, the applications were not functioning with full vigor, not only because of the incomplete work, but also due to the break in continuity.

Ultimately, the company faced a tragedy. Hershey's could have very well avoided this trouble if only they had thought of going ahead with ERP implementation during the time when business processes in the whole market were going through a lull. Any business organization will face such low periods in almost every year of their business.

If Hershey's had planned to adopt ERP during the dull period of their business, they would not have suffered to such a great extent. If some problems would have sprung up during this dull phase, Hershey's could have concentrated on resolving them, and made ERP a hit. Since companies can work and pay full attention to such processes during periods of slow/no business activities, any potential trouble can be averted. This, however, was not to be.

It is, therefore, evident that ERP implementation is a long-drawn process that needs to be implemented meticulously as even a minute mistake can spoil the hopes and purpose of the project. This case clearly shows how things get messed up due to process failure in an organization, after ERP's intervention.

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[III] ERP Implementation Failure at FoxMeyer

FoxMeyer is the fourth-largest distributor of pharmaceuticals to both druggists and hospitals in the U.S. In 1993, FoxMeyer started implementing the Vanilla version SAP ERP software. In 1996, the company filed for protection under Chapter 11 of Federal Bankruptcy Code. FoxMeyer's executives complained to the bankruptcy trust and its management that technology vendor (i.e., SAP AG, Germany, and Anderson Consulting) oversold their capabilities during the sales process.

FoxMeyer was afraid of rapid increase in transactions for various items. The daily production's outgrow was supposed to be handled by Unisys Mainframe. So, the organization wanted to shift from the old mainframe system to the new client–server based system. Subsequently, FoxMeyer selected SAP R/3 over the hardware supplied by HP, and the entire software was implemented by Anderson Consulting. The problems started to appear right at the outset of the implementation process. The master schedule had specified that each module was supposed to be implemented within two to three months. This timeline was quite unrealistic under the given circumstances since the organization lacked even skilled manpower to handle fast-track implementation. Furthermore, at the time of implementation, SAP was regarded as a supplier of accounting and manufacturing software. Hence, FoxMeyer elected to go with a warehouse system from McHugh Software International through Pinnacle. The decision to go with two different vendors for two of the company's most important business systems exaggerated the complexity of an already challenging situation, since there were now two different packages that needed to be integrated.

In July 1994, the company won a contract to supply its products to University Health System Consortium (UHC). UHC is a nation-wide network of hospitals teaching medical courses, and this deal between UHC and FoxMeyer was expected to yield up to USD 1 billion annually for five years. Prior to the deal, FoxMeyer had planned to have a small amount of capacity left on the Unisys platform once the SAP implementation was complete. But with this new contract, the transaction volume increased severely, completely throwing everything out of gear although SAP had claimed that they met with all such challenges.

To further make matters worse, the transition from old warehouses did not go smoothly. Equipment outrages resulted in the shipping of numerous half-finished orders. FoxMeyer also suffered losses in transferring inventory to the new centre. Due to the debilitating morale problem among departing workers, a lot of merchandise was dumped into trucks, and sent to their respective destinations, irrespective of their damaged condition. This led to huge shortages in inventory. Meanwhile, FoxMeyer was not progressing well on its business front. The UHC contract ultimately delivered neither the volume nor the profit margins expected. Overall, the company had overspent on the information system, which they could not absorb easily. Another major challenge faced by the organization during implementation was the conversion of data from an old mainframe to a new client–server infrastructure when the organization already had insufficient ERP skills. The company neither invested in change-management strategy, nor had a good project-planning strategy. In brief, the key factors that led to this implementation failure are as follows:

- Inappropriate changes in the software, leading to a failure in client–organization relationship
- Insufficient support to employees and system users to express their concern and relevant viewpoints
- Inadequate planning before implementation
- Impractical expectations from ERP systems
- Improper balance between the internal and external business entities, which caused a lot of friction among the employees
- Inachievable goals set by the company
- Ill timed installation of warehouse automation.

(*Compiled from Mary Sumner, 2005*)

8.3 Mitigating Implementation Risks: Critical Success Factors

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In the preceding sections, the identification of risk factors for ERP implementation had been discussed. Moving on, in this section there is a discussion on the overall ERP implementation. ERP implementation is affected by two broad categories of factors: environmental and organizational, each of which comprises five variables (*Huang & Palvia, 2001*). Environmental factors include: economy and economic growth, infrastructure, IT maturity, computer culture, and government regulations. Economic status of the nation, infrastructure including basic and IT infrastructure, level of IT maturity, and government support to IT, are broad indicators which affect the culture for ERP implementation in organizations. Organizational factors include business size, BPR experience, manufacturing strength, management commitment, and regional environment.

ERP implementations are people projects, and successful implementations require people, departments, processes, and organizational changes. As a result, during ERP implementation, there are times of high stress, long working hours, and uncertainty of time. The way a company implements its new ERP system will largely determine its success. Depending upon the specific situation, a variety of factors might be critical for the success of the implementation process. A detailed discussion on these factors will help in understanding and developing a successful implementation scheme. Some of the key success factors in ERP implementation are given below:

- Requiring appropriate business and IT legacy systems
- Creating a business plan and vision -
  - Project mission or goals
  - Justification for investment in ERP
- Preparing for business process re-engineering with minimum customization
- Developing a change management culture and programme -
  - Recognizing the need for change
  - Evolving an enterprise-wide culture and structure management
  - Educating and training the users
  - Supporting the user organization and involvement
  - Re-training the IT workforce
  - Developing the commitment to change management by perseverance and determination
- Designing proper communication -
  - Establishing targeted and effective communication
  - Initiating communication among stakeholders
  - Communicating proper expectations at all levels
  - Communicating the project's periodic progress
- Fixing ERP teamwork and composition -
  - Best people on team
  - Balanced or cross-functional teams
  - Full-time team members
  - Partnership, trust, risk-sharing, and incentives
  - Empowered decision-makers
  - Business and technical knowledge of team members and consultants
- Monitoring and evaluating the performance -
  - Track milestone and targets
  - Performance tied to compensation
  - Analysis of user feedback

- Appointing a project champion -
  - High-level executive sponsored as champion
  - Project sponsor commitment
- Instituting project management -
  - Assigning responsibilities
  - Establishing project scope clearly
  - Controlling project scope
  - Evaluating and proposing changes
  - Controlling and assessing scope expansion requests
  - Defining project milestones
  - Setting realistic milestones and end dates
  - Enforcing project timelines
  - Coordinating project activities across all affected parties
- Developing software, **testing**, and **troubleshooting** -
  - Configuration of overall ERP architecture
  - Appropriate modeling methods/techniques
  - Conducting vigorous and sophisticated testing
  - Troubleshooting
  - Integrating
- Expecting top-management support -
  - Approval and support from top management
  - Top management, publicly and explicitly, identifying a project as top priority
  - Allocating resources

***Testing:** It is the process used to assess the quality of computer software.*

***Troubleshooting:** It is a form of problem solving that involves the systematic search for the source of a problem so that it can be solved.*

Each of these success factors has been divided into sub-factors. It is worthwhile to note that many of the factors are inter-related; thus, overlooking one factor can affect other factors, and the project as a whole. Some of these factors are discussed below:

- **Requiring appropriate business and IT legacy systems:** This helps in determining the degree of IT and organizational change required for the success of ERP implementation. It means that the greater the complexity of legacy systems, the greater will be the amount of technological and organizational change required. To be successful, ERP implementation efforts must overcome the issues of complexity arising from business and IT legacy systems. A stable and successful business setting is essential, and success in other business areas is necessary for ERP's success. A stable and successful business is more likely to have a strong organizational identity, which helps in building a successful ERP system.

- **Creating a business plan and vision:** This is necessary since ERP implementations usually exceed the time frame for a typical business project. Therefore, clear goals are needed to guide the ongoing organizational effort. Business plans should outline the proposed strategic and tangible benefits, resources, costs, risks, and the timeline. ERP, being an enterprise-wide IS, needs a clear business plan and vision to steer the direction of the implementation project. The project's mission should also be related to specific business needs, and be clearly stated. Similarly, there should be justifications for investment in ERP systems based on a change in work processes that are aligned with the future direction of the organization involved.
- **Preparing for business process re-engineering:** This enables organizations to gain advantage of the best practices offered by the system. Enterprises should be willing to accept the embedded best practice, whenever possible, and model their business processes according to those depicted by the system. Organizations should be willing to change their businesses to fit the software in order to minimize the degree of customization required. Software should be minimally modified to minimize the possibility of errors, and take advantage of newer versions and releases. This further underscores the importance of a clear business plan, and a clear understanding of existing business practices.
- **Developing change management culture and programmes:** This too is an important factor. The stronger the need for change, the more likely it is that the top management and stakeholders will support ERP implementation. Enterprise-wide culture and structure change should be managed properly, including people, organization, and culture change. User involvement in the design and implementation of new business processes and the ERP system is recommended. Formal education and training should be provided to help the users understand how the ERP system will impact their jobs.

- **Designing proper communication:** This is mandatory to achieve the goals and expectations set by the organization during ERP implementation. Communication should be complete and open to ensure honesty. Users need to know that the feedback they offer regarding the processes and problems with ERP will be received and acted upon. Complete and open communication can leverage successes and facilitate enterprise-wide learning. Communication includes the formal promotion of project teams, and the periodic announcement of the project's progress to the rest of the organization. Employees should be notified about the project plan, scope, objectives, activities, and updates in advance. User input should be managed in collecting their requirements, comments, reactions, and approval. Monthly bulletins, newsletters, weekly meetings, or other communication tools can be used to keep the users informed of the project's progress.
- **Fixing ERP teamwork and composition:** This involves all functional departments in an enterprise that help during ERP implementation. The effort and cooperation of technical and business experts is required to make ERP a success. Hence, teamwork and team composition among the implementer, vendor(s), and consultants are emphasized in ERP literature. The best people in the organization should be recruited in the ERP team. The ERP team should be balanced, or cross-functional. It should comprise a mix of external consultants and internal staff members so that the internal staff can develop the necessary technical skills for design and implementation. Further, the members of the project team(s) must be empowered to make quick decisions. The sharing of information among various parties, particularly between the implementation partners, is vital and requires partnership trust. Partnerships should be managed with regularly-scheduled meetings.
- **Monitoring and evaluating the performance** of ERP projects in terms of completion dates, costs, and quality: milestones and targets also need to be actively monitored to track the progress of ERP projects. Additionally, team members' compensation should be linked to the project's performance. Performance monitoring and feedback also involve the exchange of information among project team members, and the analysis of the feedback received from end-users.
- **Appointing a project champion:** This is more important in ERP implementation than in other IS implementations because ERP's success hinges on overall organizational commitment and

perseverance. The project champion should be a high-level executive sponsor who has the authority and the influence to set goals and legitimize change. The project champion's transformational leadership skills play a critical role in implementation success, as the champion must continually resolve conflicts and manage resistance, as well as manage change.

- **Instituting project management:** This is essential because success in ERP implementation, as in most IS projects, is commonly evaluated on the basis of the degree of time and budget requirements that are met. An individual or group of people should be made responsible to drive success in project management. Establishing the program scope is key to any successful ERP implementation. Any proposed changes should be evaluated against business benefits and, as far as possible, implemented at a later phase. The project must be formally defined in terms of its milestones or clear delivery dates. Realistic milestones and end dates should be set. Timeliness of the project should be enforced periodically, and the escalation of issues and conflicts should be managed. Project management must extend beyond a clear scope and goals to include other aspects and issues of the project. All these issues are relevant for ERP implementation, which might cause program failure if not anticipated or managed well.
- **Developing software, testing, and troubleshooting**: The ERP perspective is unique, and must be well thought out and properly managed. The overall ERP architecture should be established before deployment, taking into account the most important requirements of the implementation. This allows organisations to avoid reconfiguration at every stage of the implementation, while the use of appropriate modelling methods, architecture, and tools facilitates ERP success. Requirements' definition can be created, and system requirements' definition can be documented. Organizations implementing ERP should work closely with vendors and consultants to resolve software problems. The integration of home-grown systems and specialized software products (that serve a company's unique needs) with the ERP suite) is necessary to realize the full benefits of the implementation.
- **Expecting top management's support:** To make an ERP project successful, the top management needs to publicly and explicitly identify the project as top priority. The senior management must be committed, with their personal involvement and willingness, to allocate valuable resources to the implementation effort.

This involves providing not only an appropriate amount of time and resources to get the job done, but also the necessary personnel for the implementation. The attitude of the top management towards the project determines the amount of resources allocated to the implementation project. In ERP projects, top management support is even more important. The top management's advocacy and support, as indicators of enterprise priority, may reinforce the commitment of all the employees in the enterprise to the project. The top management's commitment results in organizational commitment, which is a key factor influencing ERP implementation success.

Most of the above mentioned factors appear repeatedly in the literature concerning ERP implementation success. With a better understanding of the issues involved in ERP implementation, and the collective perspective of multiple stakeholders, the management would be more empowered to achieve organizational consensus, make critical decisions, and allocate the resources that are required to make ERP implementation projects successful.

8.4 Management and Complexity of Large-scale ERP Projects

ERP packages offer a variety of standard solutions for individual business problems; there is, however, a lack of effectiveness and efficiency in implementing large packages. Failures are attributed to unsatisfactory project management and control, incomplete goal specifications, lack of communication, and the underestimation of project complexity. So, it is important to understand the role of a program management design, and how to deal with the complexity that large implementation projects encounter from inevitable changes over time and from strong integration needs. The complexity in this context can be measured through three dimensions: variety, variability, and integration. Variety reflects the number of elements and their inter-relations in a given situation or system. It will increase with, for example, the number of sites affected, or the functions of the package implemented. Some of the following indicators reflect variety:

- Number of locations affected in implementation
- Operational differences among various sites/locations
- Level of negative predisposition from experience in similar programs having run earlier

- Conversion and migration effort in terms of level of data misfit and number of systems to be replaced

Similarly, the variability of the system relates to the dynamics over time of its elements and the inter-relationship among them. The key indicators of variability in an implementation program are -

- Level of availability of resources in terms of adequately-trained and experienced project staff members
- Level of complexity of concurrent projects
- Extent of system's redesign after pilot implementation
- Changes in goals/scope of the project

Lastly, the integration factor characterizes the proposed changes that are to be realized through the implementation program. This is achieved by integrating IT systems with business processes. This measure describes the degree of innovation in IT and business processes that should be implemented through the program.

Thus, the design characteristics of program management are largely dependent on the following key elements:

- **Program organization**: This refers to the structural organization of a team that plans and controls projects in a program, and the related resources. The teams in complex ERP implementations should be structured such that they cover all the given roles: program manager, steering committee, program sponsors, user representative, coordinators across projects, coordinators with external suppliers, coordinators for an efficient implementation process, and independent quality assurance managers. Furthermore, coordination is critical, particularly with suppliers, across individual processes to achieve a project's efficiency.
- **Policies:** Guide program management to perform within the given budgets, guidelines, and required acceptance levels and goals' adherence. A loose budget policy, in terms of time and cost restrictions, in the innovation phase (visioning, software selection, tests, and pilot) contributes to program success, with tighter restrictions being mandated in the later roll-out phase. This necessitates strict adherence to a no-change policy in the roll-out phase.
- **Plans:** This takes implementation goals and drives the projects within the program. It also looks at the extent to which implementation projects run in parallel. When the number of implementation projects is large, the program manager has to consider

parallel implementation projects in order to complete the project on time. The focus of the steering committee should be primarily on control to ensure adherence to planned changes (integration complexity), and less on unplanned disruptions.

- **Communications:** Communication acts as a means of information between teams and users. They should be used to resolve problems within the team. Complexity, due to high variety (multiple locations, etc.), demands the general management's attention, especially with regard to communication and sponsorship. When there are various implementation programs, they need active sponsorship.
- **Alignment:** This implies adapting the information system to the organization, or vice versa, in line with the business direction. Program reviews, steering committees, and other efforts can be installed in order to achieve alignment between the current goals and the requirements on the one hand, and the implementation systems and procedures on the other. A successful program of high variability utilises more organizational means for alignment than a program with low variability.

Thus, implementation success could be differentiated and dealt with by analyzing its complexity. It is possible to operationalize program complexity into variety, variability, and integration. Each variable requires a different approach to deal with it.

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8.6 Evaluating ERP Projects

In essence, ERP projects represent an investment in IT. Since ERP projects claim to cover a substantial transactional domain and displace most of the legacy systems built over decades, they tend to be the single-biggest IT investment in any enterprise. On account of ERP's huge unit costs, such projects have come to occupy a dominating position in IT investment in recent times. However, the state of evaluation of IT investments, in general, is regarded as unsatisfactory and patchy. The state of evaluation is much worse in the case of ERP projects since, in these projects it is extremely difficult to estimate all the hidden costs and to assess all the staggered and long-term benefits.

In view of the long-term and pervasive impact of ERP projects, the evaluation problem needs to have organization-wide ownership. The evaluation process needs to incorporate organizational preferences for each of these criteria. Moreover, it is necessary, periodically, to revisit the evaluation to ensure that the initial expectations are being met. The following criteria can be used for evaluating ERP software:

1. Functional and strategy fit with the company's business processes
2. Degree of integration between the various components of the ERP system
3. Flexibility and scalability
4. Complexity and user friendliness
5. Quick implementation; shortened ROI period
6. Ability to support multi-site planning and control
7. Technology; client–server capabilities, database independence, security
8. Availability of regular upgrades; local support infrastructure
9. Degree of customization required
10. Total cost, including cost of licence, training, implementation, maintenance, customization, and hardware requirements
11. Change management
12. Vendor credentials; availability of reference sites

The distinction will not be in terms of whether ERP is implemented, but which ERP product is chosen, and how it is deployed to cater to the strategic needs of the business. A wrong product selection would certainly have a long-lasting adverse impact on business performance. The factors mentioned above will provide a structured methodology to reach the best solution. The success, however, should not be assumed to be intrinsic to the framework, as much of it depends upon the climate of trust and mutual support within the team, as well as the readiness for change in the organization beyond the team.

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Table 8.2 ▶
ERP implementation risk factors

Risk category	Risk factors
Organizational environment	– Insufficient resources for implementation – Considerable change in processes – Failure to redesign business process – Failure in supporting cross-organizational design – Higher Degree of computerization
Personnel issues	– Failure to recruit or retain ERP professionals – Lack of appropriate experience among internal users in team – Lack of ability and experience with ERP among the employees – Inappropriate staffing – Lack of functional analyst with business and technology knowledge – Failure to integrate internal and external expertise for implementation of ERP
Project management and control	– Non-clarity of project goal – Non-participation of top management employees – Inappropriate composition of project team – Lack of effective project management methodology
Software system design	– Frequent changes in requirements – Lack of effective software management methodology – Non-compliance with ERP software standards – Lack of integration among different components of enterprise-wide systems – Developing the wrong functions and wrong user interfaces
User involvement and training	– Communication gap between organization and the users at all levels – Conflicts among departments – Failure to get user support – Ineffective and insufficient training of end user
Technology planning	– Inappropriate IT infrastructure in the organization – Unfamiliarity with contemporary technology – Stability of current technology – Attempt to link legacy system

LEARNING OBJECTIVES

Upon completion of this chapter the student should be able to –

- understand the concept of going live with ERP
- understand the migration strategies to a new ERP system
- anticipate go-live performance surprises
- understand fully the process of managing ERP after going live
- comprehend the process of maintaining ERP systems

9.1 Preparing to Go Live

Many organizations face several performance surprises when they go live with a new ERP system. Just before going live, it is important to pause and evaluate the job done during ERP software implementation. There are many issues that need to be considered before going live with new ERP implementation. Some of the key issues are:

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- Identifying what technical processes and infrastructure preparation are required to enable the ERP to go live
- Perform integration testing:
  - Functional modules
  - Implement database instance
  - Vendor modules
- Develop different checklists, such as:
  - Legacy checklist
  - **ERP checklist**
  - Help-desk checklist
  - Support checklist
  - Implementation checklist

> ***ERP checklist:*** *A checklist that is used to compensate for the weaknesses of human memory in helping ensure consistency and completeness in carrying out a task.*

- Check support readiness in terms of:
  - Help-desk process
  - Tri-level **workflow model**

Workflow Model: A workflow is a reliable and repeatable pattern of activity enabled by a systematic organization of resources, defined roles, and mass, energy, and information flows, into a work process that can be documented and learnt.

- Check production operations' readiness for:
  - Coverage during standard and non-standard hours
  - Ensure sufficient operations' depth
- Check infrastructure readiness for:
  - Performance demands
  - Capacity evaluation
  - Upgrade, where necessary
- Prepare implementation schedule, indicating:
  - Timeline for production usage of each functional module going live
- Plan contingency for:
  - Performance and capacity failures in infrastructure
  - Inability to move to production at right time
  - Production disaster recovery
- Consider communication for:
  - Ongoing documentation and communicating implementation actions and their rationale
- Consult support by:
  - Creating insurance policy by requesting on-site support from all vendors

The most important issue among the above is to develop a cutover checklist. Various elements must be included in the cutover checklist. It is important not to sacrifice any important step in order to meet the go-live date. Given below are some elements that are an essential part of the checklist:

1. Draft a contingency plan, in case the new system does not work. It means that an organization should know what it needs to do in case of having to revert, to the legacy system. For example, the ways to manage transactions whenever there is a technical failure or server shut down and users are without computer systems.
2. Create master data in the database of the ERP systems. For example, an open balance of stock for each stock location, an account ledger balance, bill-by-bill break-up for aging purposes, etc., need to be printed and certified by the concerned users.

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9.2 Strategies for Migration to New ERP Systems

Migrating to new enterprise software applications is a very complicated job for the information technology (IT) manager. But following these best practices can facilitate safe migration.

- Taking a slow, incremental approach towards ERP migration is the best way to guard against failure. There is always a risk in complete migration as it may jeopardize the business if the implementation does not go well. Also, if the organization tries to carry out all the activities simultaneously, the possibility of things going wrong is high. A better approach is to identify the most critical function that needs to be upgraded. This implies that the organization would be running parts of the old system along with the new application, thereby increasing the chances of risks.

- Focusing on the needs of the organization is a major requirement, and any customization could drive up the cost, the complexity, and the risks involved in the implementation process.
- Getting a vendor's accountability in writing is crucial. The ERP vendor should state assurances in the contract (such as those pertaining to integration with other systems, service-level agreements, and support, and so on), and spell out any penalties the adopting organizations need to accept for not abiding by the terms.
- Understanding an organization's environment before migration is an important task for the implementation team. ERP migrations are further complicated by the fact that most IT managers do not have sufficient information about their older system. They are unaware of details such as exactly what version of software is running, which **patches** have been installed, what modifications have been made, and why such modifications are often lost with the employees who were involved with the legacy system but are no longer with the company. The most important question is why modifications were made in the first place. The organization needs to know whether to make a similar customization in the new system. They should not forget to document each process as well as the technical implementation details of the new system. This is done to make sure that the organization does not have to scramble the next time around.

***Patche:** In computing, a patch is a small piece of software designed to update or fix problems with a computer program or its supporting data. This includes fixing bugs, replacing graphics, and improving the program's usability or performance.*

- Adopting structured and standard data models in order to save time and avoid industry-related inter-operability issues is another must-do. The organization's ERP migration process will always involve switching from legacy data models to the new application's data models. Most vertical industries have standards' consortia that establish common data master models, such as customer and product — for example, UCCnet covers retail industry standards, Rosetta-Net is for the electronics industry, and so on. Rather than trying to create their own data models, adopting organizations should make every attempt to migrate their data types to the standard models. This will make it much easier to exchange data and collaborate electronically with third parties, both now and in the future.

Still, the most important thing is to acknowledge and address user concerns. Changing the major system that runs your business impacts everyone, most especially the users who will have to learn a new way of working when you are done with the migration.

1(b) **ERP Upgrade Stage** This phase comprises the activities and factors that should be considered while upgrading an existing software system with a new version. The sequence of steps and the tasks involved in this phase are:

1. Design the ERP software upgrade method, and tailor it for internal use.
2. Identify benefits and challenges of each upgrade option, and its support option.
3. Develop actual situation/case to test and perform the upgrade and justify the decision.
4. Make full assessment of the modifications in the current version and technical environment by identifying the number of business modifications and linking them to business reasons.
5. Assess the new functionality and its technical requirements by evaluating its benefits, technical requirements, and drafting a plan for benefit realization. Also, conduct an impact analysis of the new upgraded version and the existing version.

6. Install the new version with the required modification on the live ERP system, and conduct thorough testing of the upgraded system before going live with the new version.