# THE IMPLEMENTATION OF INFORMATION TECHNOLOGY SOLUTIONS

## CONTENTS

<table>
<thead>
<tr>
<th>Paragraph</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td></td>
</tr>
<tr>
<td>Executive Summary</td>
<td>1-5</td>
</tr>
<tr>
<td>Key Definitions</td>
<td>6</td>
</tr>
<tr>
<td>Why is the Implementation Process Important?</td>
<td>7</td>
</tr>
<tr>
<td>What is the Implementation Process?</td>
<td>8-9</td>
</tr>
<tr>
<td>The Key Principles of Implementing IT Resources</td>
<td>10-28</td>
</tr>
<tr>
<td>The Best Approach for Implementing IT</td>
<td>29-45</td>
</tr>
<tr>
<td>When Should the Implementation Process be Applied?</td>
<td>46-47</td>
</tr>
<tr>
<td>Who is Involved in an Implementation Project?</td>
<td>48-50</td>
</tr>
<tr>
<td>Communication Plan</td>
<td>51-52</td>
</tr>
</tbody>
</table>

Appendix 1: Package Software Implementation — The ERP Method

Appendix 2: Package Software Implementation — The Groupware and Intranet Method; The Data Warehouse Method

Appendix 3: Customized Software Implementation — The Specific Development Method

Appendix 4: Tailored Hardware and Software (Infrastructure Architecture) Implementation — The Technical Method

Appendix 5: Other Methods
PREFACE

In today’s digital world, the management of information, information systems and the communication of information to interested parties is key to the success of every organization. This is because of:

- The increasing dependence on information and on the systems and communications that deliver the information.
- The scale and cost of current and future investments in information technology.
- The potential of technology to dramatically change organizational and business practices, create new opportunities and reduce costs.

Many organizations recognize the potential benefits that technology can yield. But, with those potential benefits, come risks. To provide effective direction and adequate control, executive management of successful organizations must not only appreciate the possible benefits, but also properly manage the risks and constraints of information technology.

In this guideline series, the International Federation of Accountants, through its Information Technology Committee, seeks to promote executive understanding of key issues affecting the management of information and communications. This series of guidelines is written for management.

This guideline is the fourth in the series and covers the implementation of information technology (IT) solutions. It sets out the main principles for IT project management, including risk management. These principles can be applied following various methods for conducting a project, depending on the project’s size and risk factors and the IT resources required.

Executives in various capacities (for example, accountants, financial controllers, auditors or business managers) are frequently asked to manage, participate in, assess or comment on IT implementation processes. They can do this only if they have a sound knowledge of the principles and practices required to manage the implementation of IT resources.

IFAC’s Information Technology Committee would like to acknowledge the support from the Information Systems Audit and Control Association and to thank its various contributors who provided valuable input for this document:

Task Force

Nidal Alakl, SEMA Group
Darryl Ferreira, PricewaterhouseCoopers
François Vidaux, APICIL ARCIL
Serge Yablonsky, SYC (Chair)

Olivier Dutartre, Ernst & Young
Eric Jeancolas, IBM
Claude Voisin, Société Générale
EXECUTIVE SUMMARY

WHY?
1. To take advantage of the great strides being made in the information technology arena, most organizations have now aligned their IT planning with their business objectives (as described in the second guideline in this series, “Managing Information Technology Planning”) and have followed a structured approach to acquiring IT solutions (as described in the third guideline “Acquisition of Information Technology”). The approach to implementing IT described in this guideline builds on the previous guidelines and provides:
   • an understanding of the critical success factors pertaining to IT implementation; and
   • a structured basis for implementing IT solutions.

   The following summary explains the basic principles involved and provides a brief outline of how IT implementation projects are to be managed. To fully understand the summary, please read the definitions found in paragraph 6 first.

WHAT?
2. IT projects are launched to implement the decisions made in the strategic IT planning phase. An IT project may cover the acquisition and implementation of IT resources such as data, application systems, technical components, facilities and, eventually, the relevant people. Although each IT project is unique in terms of its needs and circumstances and may vary considerably in complexity, it is generally conducted according to the following principles:

   CORE PRINCIPLES

   • **ALIGNED SCOPE** — The scope of the implementation of an IT solution should be aligned with the objectives first developed during the acquisition phase, including any issues of integration and implementation timing.

   • **PROJECT MANAGEMENT AND COMMITMENT** — An IT project must be properly managed. To achieve this goal, the human resources allocated to the project need to have experience in project management, technical competence and knowledge of the organization’s business processes.

   • **MANAGING CHANGES, AWARENESS AND COMMUNICATION** — When preparing an organization for the implementation of new systems, the issue of change management must be specifically addressed and a communication plan must be established to ensure that all relevant parties are kept informed about the progress of the project.

   • **SELECTION OF THE RELEVANT IMPLEMENTATION METHODS** — There are several methods for implementing a new IT system. The method chosen will depend on the type of IT development selected. To ensure the successful implementation of the solution developed, it may be necessary to follow elements of several different methods.

   • **IMPLEMENTATION PHASING** — Depending on the method chosen, the phasing of an IT project may either be strict and detailed or more iterative. It is essential, however, to include the following five major project phases: general design, specifications, development, completion (migration and tests) and deployment.

   • **INTEGRATION** — The final product of the IT project will generally either be a new application system or new technical facilities, which must then be integrated into the existing information system.

   • **RISK MANAGEMENT AND MONITORING** — The project risks must be continuously evaluated during the project and alternative contingency solutions identified. To ensure effective
project management, performance indicators must be established and reviewed regularly. Regular management reporting is also essential.

HOW?

3. Although projects involving IT implementation vary depending on the context and IT resources involved, the major underlying phases remain similar.

METHODS

How an IT solution is implemented depends on the method chosen. Each method is specific to the technology acquired. It is important to select the appropriate method or methods for a project because:

• A project usually comprises several elements, for example, a software package, interfaces with the existing system, technical architecture, etc.

• The system development life cycle differs depending on the approach, being either:
   (a) an iterative approach: a prototype is built and enhanced until all needs are dealt with and the users are satisfied. Some phases of this type of project are more or less linked. This approach is usually applied to the implementation of a software package or the development of system using a Rapid Application Development method; or
   (b) a linear approach: the project follows a step-by-step method, with a strict validation of each phase before proceeding to the next. This approach typically applies to large, specific development projects.

PHASES

As shown on the following diagram, the phases are carried out at the project level or at the methodological level:

Project level

1. General design and mapping — this phase includes the integration of the project with the overall existing information system and the definition of the method or methods to be followed.

Methodological level

2. Detailed specifications — this phase includes translating user requirements into detailed specifications. Depending on the method or methods chosen, this may be included in the prototyping exercise.

3. Development — this is mainly the coding or the customization of the system with relevant documentation (technical and user). Testing is also performed at a technical level.

Project level

4. Completion — this refers to the tests the users perform on the completed system after it has been integrated into the overall information system.

5. Deployment — this is the final phase where the system is implemented. All users are trained and any final changes are made.
The acquisition phase of the diagram is shown simply for reference purposes; it is discussed in the previous guideline.
WHEN?

4. A project’s implementation phase follows the successful acquisition of an IT solution and should be completed within a stipulated project timetable.

WHO?

5. The organization’s process owner(s) should have the prime responsibility for making overall decisions, as long as the sponsor agrees. The day-to-day responsibilities and roles are then delegated to:

   • A project steering committee, which will review the project as it unfolds and make whatever decisions are required along the way. This committee includes the process owner(s), an IT department representative, the project leaders, a quality controller and, perhaps, a representative of the supplier or the external development team.

   • A project team, which is usually led by the project leader, who is a member of the process owner’s (or owners’) department(s). The leader is assisted by a member of the IT department. In addition, the project team should include representatives of the end users and of the IT department, as necessary. External consultants may also be members of this team.

   • A quality control team.

All project steering committees report to the IT strategic committee, which is in charge of all IT planning and overall management.

KEY DEFINITIONS

6. **Acquisition**: the identification and selection of suitable IT solutions for an organization based on its business requirements.

**Enterprise Resource Planning (ERP)**: planning the implementation of standard package information systems that link together all of an organization’s operations (including human resources, finance, manufacturing, sales and distribution), as well as connect the organization to its customers and suppliers.

**Implementation**: the installation of new hardware, system software, databases and application programs, as well as the adoption of new manual procedures.

**Information System**: the infrastructure of information technologies, together with data and information that may be recorded, stored, processed, shared, retrieved or transmitted by them.

**Information Technology**: the technology infrastructure and applications, together with the data and information that may be recorded, stored, processed, shared, retrieved or transmitted by them.

**Process owner(s)**: the senior members in an organization who are responsible for developing and maintaining its various core business processes.

**Project**: the consolidated activity of performing the tasks required to complete a given assignment within a specified timeframe as defined by the IT plan.

**Resources**: the hardware, software, telecommunications, personnel, data, processes and facilities required to develop and maintain an information system.

**Method**: the chosen path for the implementation of an IT solution.
**Sponsor:** Member(s) or duly nominated representative(s) of the Board of Directors, vested with the authority to take the decisions concerning the project on behalf of the Board, without reference to the latter on a day-to-day basis.

**WHY IS THE IMPLEMENTATION PROCESS IMPORTANT?**

7. Because the implementation of IT solutions can incur cost overruns, implementation delays and user dissatisfaction, it is essential to exercise good control over the implementation process and to ensure that it proceeds in accordance with well-defined project guidelines.

These guidelines should include a close liaison with system users and should be reviewed and approved by the organization’s information systems management. The major participants involved in the IT solution’s implementation should be identified and their roles and responsibilities defined.

**WHAT IS THE IMPLEMENTATION PROCESS?**

8. The implementation process is the activity of converting the IT solution acquired during the acquisition process into a system the organization can use.

9. The objective of the implementation process is to identify all activities and resources required for IT implementation and then structuring these in the most effective manner to achieve the objectives defined in the project planning.

**THE KEY PRINCIPLES OF IMPLEMENTING IT RESOURCES**

10. Organizations undertaking new system acquisition and implementation projects should adhere to seven key principles to ensure the success of their projects. These principles are discussed briefly below.

**ALIGNED SCOPE** — The scope of the implementation of an IT solution should be aligned with the objectives first developed during the acquisition phase, including any issues of integration and implementation timing.

11. The timing of the implementation should be planned in detail according to the implementation method chosen and also at a project level, i.e., it should be in accordance with common project deadlines.

**PROJECT MANAGEMENT AND COMMITMENT** — An IT project must be properly managed. To achieve this goal, the human resources allocated to the project need to have experience in project management, technical competence and knowledge of the organization’s business processes.

12. Project planning is the process of ensuring that the project’s objectives are translated into a work program. Project control is the process of ensuring timely execution of the tasks identified in the project plan.

13. The project plan should reflect the objectives of system implementation by providing guidelines, task definitions and time schedules. The most relevant project management method should be chosen.

14. Project control ensures effective delivery of the project and involves monitoring progress and taking steps to ensure that each task is accomplished as intended. Project control will include the assignment and supervision of work performed, the recording of work accomplished, a comparison of work performed against the project plan, the identification of discrepancies and the initiation of corrective action where necessary.
Project planning and control require the commitment of executive managers who are knowledgeable about the organization’s business processes and also have the requisite technical competencies.

MANAGING CHANGE, AWARENESS AND COMMUNICATION — When preparing an organization for the implementation of new systems, the issue of change management must be specifically addressed and a communication plan must be established to ensure that all relevant parties are kept informed about the progress of the project.

For a project to be successful, it must meet three principal criteria:

- it must be planned — there must be a plan with fixed objectives;
- it must be relevant to user requirements or specifications;
- it must be agreed on — the original plan and any changes must be accepted by all users.

The success of any change management project hinges on a good understanding of the objectives to be achieved. These objectives must be considered throughout the duration of the project, and everyone involved in the project should be committed to supporting the change management process.

To facilitate the acceptance of change, the objectives and progress of the project should be regularly communicated to all concerned. Attention should also be given to appropriate external parties, for instance, suppliers and customers.

SELECTION OF THE RELEVANT IMPLEMENTATION METHODS — There are several methods for implementing a new IT system. The method chosen will depend on the type of IT development selected. To ensure the successful implementation of the solution developed, it may be necessary to follow elements of several different methods.

The project managers should define their approach to a new system implementation by selecting the relevant implementation methods. These methods will assist project administration by identifying the critical success factors, major risks and deliverables for each stage of the implementation. The method selected will also ensure that the project remains focused on only one specific direction.

The methods differ depending on the IT solution implemented, as the system development lifecycle (SDLC) is specific to the type of IT involved.

IMPLEMENTATION PHASING — Depending on the method chosen, the phasing of an IT project may either be inflexible and detailed or more iterative. It is essential, however, to include the following five major project phases: general design, specifications, development, completion (migration and tests) and deployment.

A new system is ready for migration to the production environment when the following steps have been completed:

- detailed formal design;
- detailed specifications and development;
- full system testing;
- making subsequent required refinements to the system;
- all procedures and schedules required to properly operate the system are in place;
- all essential data have been converted and loaded into the new system database;
- all users have been fully trained to use the new system.
22. The system migration should be planned for a date that will not affect the organization’s normal business processing. Thus, the implementation should not be scheduled to coincide with peaks in the business cycle.

INTEGRATION — The final product of an IT project will generally either be a new application system or new technical facilities, which must then be integrated into the existing information system.

23. Integration generally involves reviewing the organization’s current information system to ensure that any new development conforms to the architecture already in use and that the changes are correctly organized and coordinated. “Architecture” refers to all hardware, system software, communications structures and protocols, data and databases, external interfaces and peripheral devices.

RISK MANAGEMENT AND MONITORING — The project risks must be continuously evaluated during the project and alternative contingency solutions identified. To ensure effective project management, performance indicators must be established and reviewed regularly. Regular management reporting is also essential.

24. The evaluation of project risks should focus on the risks that may have an impact on the long-term viability of the project. The nature of such risks may be operational, financial, regulatory or control oriented.

25. A risk assessment may be used to evaluate potential project risks. This assessment could:
   • assist management with the effective allocation of limited resources;
   • ensure that relevant information has been obtained from all levels of management;
   • establish a basis for effectively managing the project;
   • provide a summary depicting how the individual project areas relate to the overall project and to the business as a whole.

26. Alternative contingency solutions must be developed to deal with any significant risks identified. These alternative solutions may include continuing on the chosen route and/or applying manual procedures.

27. For the installation of a new system to be successful, it must be properly designed, developed and integrated. It should also be subject to continuing budgetary control. The continuous monitoring of the project will assist management in determining whether this has been done.

28. Project monitoring will allow management to:
   • assess the adequacy of the new system in meeting the pre-defined user requirements;
   • determine whether sufficient and adequate controls have been implemented;
   • evaluate the projected costs and benefits and allow their periodic revision;
   • develop recommendations for addressing inadequacies identified before final system implementation.

THE BEST APPROACH FOR IMPLEMENTING IT

General Design and Mapping

Method selection

29. In the implementation part of the project, some phases relate to the global project and some relate to the specific method of implementing it. At the early stage, the general design and the integration of the IT solution into the overall information system would be considered part of the global project, as
would the completion stage, the global acceptance tests and the deployment of the system. The intermediate phases — detailed specifications and system development — depend on the method or methods chosen for the implementation. The identification of the relevant method or methods is an important tactical choice as many projects overlap due to the systematic application of a specific development approach for implementations, such as the use of packaged software or GroupWare tools.

30. Having decided to acquire a new IT solution, an organization must determine which method to follow in implementing the new system. The method will depend on a number of factors, including the type of solution chosen, its suitability for meeting users’ requirements, the technical complexity of modification, the size of the new system and the availability of resources to make any required modifications. Different methods are often used for different components of the project. Commentary on several such methods is set out in Appendices 1 — 5.

31. A detailed plan should be drawn up for each component to be implemented, which will highlight all the tasks to be performed, set deadlines and define deliverables.

**Project plan and organization**

32. Various techniques are available for controlling the project’s development and implementation cycle. The techniques will vary depending on the size and complexity of the project. Some of the more popular techniques are:

- Program Evaluation Review Technique (PERT), a network management technique that assumes the project is a collection of tasks that can be started and stopped independently.
- Critical Path Method (CPM), a technique in which the project activities are represented as a network, where each activity is shown with the activities that precede and follow it.
- Detailed budgets and schedules, which estimate the resources and time required for the IT solution’s development and implementation.
- Function Point Analysis (FPA), used for estimating the complexity of developing business applications by referring to the number and complexity of the inputs, outputs and files used.

**Architecture and mapping**

33. The current business and IT environment should be described and documented, as should all the business and IT requirements affecting the design of the new system. This would include identifying all aspects that can affect the designed system, including interfaces to existing systems, data used by the new system, IT standards and mandated technical architectures.

34. A system building-block technique may be used during this phase to develop the basic nature of the system architecture. The new system processing and data are placed on these system building blocks and an architecture is mapped out. This architecture is communicated to other relevant groups for their input and approval.

**Global Acceptance Tests**

35. When, for a defined IT project, all necessary methods have been followed, the next step is to perform unit testing for each part of the project at the module level. This is followed by global acceptance tests that will completely test the new application to be integrated into the overall information system. This phase includes testing the migrated data and the system documentation. If possible, parallel runs are performed and the results are compared.

36. Critical success factors of this phase are:

- the test methodology and documentation;
- the completeness of the test data;
- the active involvement of the users on the project team;
- the quality of the system documentation produced;
• the involvement of the IT production department to ensure satisfactory system integration;
• the involvement of the quality assurance service and/or the audit department.

37. Major risks during this phase are:
• the potential business consequences of invalid data processing.

38. Deliverables from this phase are:
• the test data and the test results;
• the formal agreement for deployment.

Deployment and Production

39. During deployment and prior to commencing production using the new system, all end users must be trained to use the new system, to understand the changes within the organization and to use the new working procedures.

40. Production should commence at only one site, a pilot site, before being deployed to other sites. A specially trained help desk should be available during the deployment phase.

41. Production should begin only when all system development and testing activities have been completed, the necessary programmed procedures and production schedules are in place, all relevant data have been converted and all users have been properly trained.

42. Activities during this phase are:
• organizing and carrying out the implementation;
• arranging system maintenance.

43. Critical success factors of this phase are:
• proper system of change control;
• education and training of system users;
• employment on a suitably representative test site.

44. Major risks during this phase are:
• inadequate control over the migration process;
• new system provides insufficient functionality;
• dissatisfied system users.

45. Deliverables from this phase are:
• the project’s final costs and comparison with budget;
• service contract between the production department and the system users;
• continuity plan.

WHEN SHOULD THE IMPLEMENTATION PROCESS BE APPLIED?

46. IT solutions should be implemented in accordance with the organizational strategic plan that decides which IT projects will be dealt with according to their importance to the organization and the availability of resources. The planning of the implementation process is reviewed in detail at the end of the acquisition phase, which, in effect, constitutes the first phase of implementation.

47. The implementation phase should commence when the acquisition phase has been completed. Implementation should be considered only when full system testing has been completed, the necessary programmed procedures and production schedules are in place, all data have been
successfully converted and all users are properly trained. The implementation should be scheduled for an off-peak period (e.g., a weekend) so that it will not affect normal business processing.

WHO IS INVOLVED IN AN IMPLEMENTATION PROJECT?

48. The business process owners are responsible for making the decisions to implement new IT solutions. The project sponsor, who is a senior executive of the organization, will then see to it that these decisions are carried out. The project is managed as follows:

- **A project steering committee**
  
  This committee is responsible for determining the direction of the project and for all decision making required during the project. It comprises the owners of the business processes, relevant IT representatives, project managers, quality controllers and any external monitoring groups.

- **A project team**
  
  This team, which is directed by a project manager who represents the business process owners, comprises representatives from the various user groups, subject matter experts and IT personnel. External consultants could also be included to assist on IT and project management issues. The project team and consultants must have the skill and competence to carry out the required tasks (e.g., technical, managerial and language skills). The project team is responsible for:
  
  - the detailed project planning;
  - documenting the approach to the implementation to ensure consistency and facilitate quality control;
  - planning and executing user acceptance tests.

- **An external quality control team**
  
  This team is responsible for continuous project monitoring and ensuring that it progresses in accordance with the stated acceptance and implementation methodology. It must include members capable of evaluating the project progress and making any necessary changes. It is also responsible for:
  
  - ensuring the active and coordinated participation of all relevant parties;
  - delivering regular progress reports on the project;
  - establishing a system of quality assurance;
  - making recommendations for improvement where appropriate.

49. All project committees must account for their activities to the committee responsible for strategic IT planning.

50. It should be noted that the roles and responsibilities of the users are becoming increasingly important. In the case of application system projects based on market solutions, the users may play a larger role than the IT specialists.

COMMUNICATION PLAN

51. The process of IT implementation should be communicated to all relevant parties. This involves drawing up a communication plan that ensures:

- relevant issues are communicated to all concerned in a timely manner;
• various types of communications are addressed to different audiences, with the content of each communication tailored to suit their differing requirements;
• all changes, suspended issues and important decisions are communicated in a timely manner;
• participants are made aware of each non-planned incident that may influence the project.

52. These specialized communication should be addressed to:
• all persons directly concerned by the implementation process;
• all future users; and
• anyone else who has to be aware of the implementation, including business partners, customers and suppliers.
Appendix 1

PACKAGE SOFTWARE IMPLEMENTATION

The ERP Method

53. The main features of ERP relate to the customization of an existing multi-user system. As such, the main task involves setting up the software. The implementation methodology followed is usually the one proposed by the software supplier instead of that normally used internally, as the internal methodology is too specific to the project.

Phase 1 — Prototyping

54. A productive approach is to prototype each type of business process with the assistance of a system expert and then to expand the prototype to all processes. The prototyping phase is iterative as it is modified until the system satisfies the user requirements. Normally, this phase limits having to develop detailed specifications as the requirements are set up directly with the system. A preliminary activity of this phase is the training of the project team.

55. The critical success factors of this phase are:
   • adapting the internal organization instead of modifying the software taking into account that the software has been built and used for many other similar projects. Consequently, it provides an opportunity for a reengineering of the organization;
   • change management resulting from any organizational reengineering;
   • competency of the system experts as they have to prototype the user requirements in real time;
   • competency of the users in the business processes.

56. The major risks during this phase are:
   • high development and maintenance costs if the software has to be modified instead of merely customized;
• limited life-span if the software modifications restrict the upgrade of the system when updated software releases become available.

57. Deliverables from this phase are:
• guideline to set up the customized system;
• details of the required modification specifications or supplementary developments to be followed up during the development;
• change management guidelines.

Phase 2 –Full deployment of the software

58. The purpose of this phase is to expand the prototype to all processes. For example, if two types of purchase orders have been prototyped, raw materials and office equipment, the phase of setting the necessary parameters would consist of setting up the system for all raw materials and all office equipment purchase orders.

59. At the end of this phase, the system is completely set up and unit tests are performed.

60. The critical success factors of this phase are:
• involvement of representative users on the project team as they are fully trained and have the best knowledge of the business processes;
• quality and quantity of tests.

61. The major risks during this phase are:
• user dissatisfaction and lack of productivity due to some processes being absent or not completely set up.

62. Deliverables from this phase are:
• the customization guide;
• the user manual;
• the test data and test results.
63. The main characteristics of GroupWare and Intranet tools, as well as data warehousing, relate to the "toolbox approach" of the development environment. This approach allows quicker development of communication and data retrieval applications and facilitates an easier upgrade of applications than is possible with traditional specific developments. For example, an order-entry application based on workflow will be distributed, requiring only limited resources, to its commercial users using the group communication system. This application can also be upgraded and deployed with limited resources. The implementation of a data warehouse is much the same. Within the same environment, new types of information are regularly added and linked with existing ones to increase the added value of information distributed.

64. Using the toolbox environment for the GroupWare and Intranet methods permits the regular deployment of new and improved applications.

65. Groupware and data warehousing applications now have increased points of entry or access to the management information system, using the communication system to enter data or retrieve them. As such, GroupWare and Intranet applications may be just one part of a more global project. This is also true of data warehousing.

66. Due to the flexibility of those toolboxes, the implementation approach of a GroupWare application must be iterative and based on prototyping, with a pilot site for testing before its final deployment.

67. Critical success factors of this phase are:
   - the participation of a GroupWare or data warehousing expert who is familiar with the complete communication system;
   - the availability of representative users, as they know the business processes;
   - the management of system access, as these systems are open;
   - the specification of validation and integrity controls.

68. Major risks during this phase are:
• data errors due to insufficient controls;
• audit trail reliance on the quality of the GroupWare or data warehouse environment and its development.

69. Deliverables from this phase are:
• the help procedures;
• the test data and the test results.
The Specific Development Method

70. The main concept of the specific development method lies in assigning a specific team of analysts and programmers to develop a system to satisfy the user requirements. The involvement of the users is imperative to ensure that the system delivered satisfies their requirements.

71. The project may consist of either a complete specific development or only of the realization of interfaces between the existing information system and the new software to be implemented.

Conception Phase

72. The decision to use a specific development method was made at the acquisition phase, when the suitability of the proposed system was analyzed according to the organization’s requirements. The set-up develops in the conception phase.

73. Activities during this phase are:
   - definition of the required architecture;
   - organization of the tasks;
   - formulation of scenarios pertaining to the development and migration of the new system.

74. Critical success factors of this phase are:
   - competence of the project management;
   - effective structure and ordering of the project team;
   - suitable choice of project methodology;
• effective procedures for change management;
• periodic risk analysis.

75. Major risks during this phase are:
• imprecise project objectives;
• inaccurate estimation of project costs and delays;
• inadequate project organization and insufficient project guidance.

76. Deliverables from this phase are:
• study of the economic feasibility of the project;
• general project definition;
• quality assurance plan;
• test plan;
• project plan.

Phase 1 — Specifications

77. The detailed specifications are developed taking into account the general project definition, the quality assurance guidelines and the project plan. It is important to keep in mind that the user requirements were already defined during the acquisition phase.

78. Activities during this phase are:
• preparation of the functional and technical specifications for the system;
• preparation of the user acceptance testing and quality assurance.

79. Critical success factors of this phase are:
• competence of the project management;
• quantitative and qualitative aspects regarding the structure of the project team;
• quality of the documents produced, the functional and technical requirements and for testing and quality assurance;
• periodic risk analysis.

80. Major risks during this phase are:
• non-delivery if the specifications are incompatible with the general concept of the project;
• same as previous phase.

81. Deliverables from this phase are:
• the detailed specifications the organization requires for the new system;
• specifications pertaining to system security and support;
• scenarios to be used during system testing.

Phase 2 — Development

82. The development phase involves coding or modifying the system to suit the requirements of the organization as detailed during the specification phase. This development should be documented to ensure that future versions of the system could be updated efficiently.

83. Activities during this phase are:
• the programming necessary to ensure the system meets the organization’s requirements;
• unit and integration testing;
• creating or updating the user and operational documentation to reflect these developments;
• monitoring the work performed by third parties.

84. Critical success factors of this phase are:
• stability of project specifications;
• adherence to quality assurance guidelines;
• ensuring that all parties involved understand the project stakes and are motivated to achieve the desired results;
• division of the project into manageable stages to allow for a staggered delivery;
• not underestimating the validation activities;
• periodic risk analysis.

85. Major risks during this phase are:
• inadequate project management;
• underestimation of the technical complexity of creating or modifying the software;
• non-achievement of budgets and project milestones.

86. Deliverables from this phase are:
• operations manual;
• user manual;
• set of test cases;
• implementation plan;
• quality assurance plan for system maintenance;
• system maintenance documentation.
Appendix 4

TAILORED HARDWARE AND SOFTWARE (INFRASTRUCTURE ARCHITECTURE) IMPLEMENTATION

The Technical Method

87. The focus of the technical method is on implementing the delivery platform to support an information system. Using this method, the design requirements are consolidated, validated and set up. The hardware and software to address the design requirements are implemented and a suitable infrastructure architecture is developed.

**Phase 1 — Detailed specifications**

88. This phase comprises developing the high-level architecture requirement into a detailed specification. This is done by further decomposing the system building blocks to facilitate the placement of data and processing. This might, for example, involve the use of database management software or software for application generating. The functions for supporting the data and processing requirements are then identified.

89. The critical success factors of this phase are:
   - accurate decomposition of system building blocks;
   - the integrity and completeness of work product inputs, i.e., the definition of the proposed infrastructure architecture;
   - effectively placing all the data and processing requirements of the proposed architecture to ensure optimization of the new system;
   - validating all the changes to the system design against the system architecture;
   - ensuring that the business process owners, the systems analyst, infrastructure designer, IS architect, application designer and platform specialist all have a common understanding of the phase requirements.

90. The major risks during this phase are:
   - selection of inappropriate architecture;
• instability of requirements.

91. Deliverables from this phase are:
• detailed specification of the proposed infrastructure architecture.

Phase 2 — Installation of IT components

92. This phase comprises configuring the technology components that will satisfy the identified IT requirements for the new system. A structured design walk-through of the architecture should be performed to confirm that the component selections and configurations would work in practice.

93. The critical success factors of this phase are:
• the integrity and completeness of work product inputs, i.e., the detailed specification of the proposed infrastructure architecture;
• suitability of vendor selection, if so required;
• usage of detailed configuration and modeling tools;
• ensuring that the business process owners, the IS architect, project sponsor, IT specialist and infrastructure designer all have a common understanding of the phase requirements.

94. The major risks during this phase are:
• unavailable or inadequate IT components;
• incompetent selection of IT components;
• lack of clear and comprehensive project scope definition.

95. Deliverables from this phase are:
• detailed design of the infrastructure architecture.
OTHER METHODS

96. Various other project methods exist to assist in system implementation. Examples of such methods are:

- Rapid Application Development (RAD), a methodology that enables organizations to develop systems more rapidly by using a series of proven development techniques within a well-defined methodology.

- Structured Analysis (SA), a framework for analyzing the physical components (data and processes) of an application by using data flow diagrams.

- Object-Orientated System Development (OOSD), a process of solution specification and modeling that is divided into stages of abstract design and detailed design.

- Reverse Engineering, the process of taking a system apart to determine how it works and then re-assembling it to develop a similar system, but one that more closely satisfies the organization’s requirements.