1. Introduction

Information systems (IS) projects typically go through a number of stages collectively known as the IS project life cycle. In this topic, we will look at the various phases of the IS project life cycle.

Objectives: Information Systems Project Life Cycle

Upon completion of this topic, you should be able to
- explain the different phases of the IS project life cycle
- prepare a business case for a project
- evaluate projects proposals based on specified criteria

2. Information Systems Project Life Cycle

Click the link below to view the animation which illustrates the different phases of IS project life cycle.

[IS project life cycle]
• Coding
• Data conversion
• Testing
• Implementation

These activities tend to flow serially, although there is often considerable overlap between activities, activities that run in parallel, and where there is no clear-cut transition from one activity to the next. In fact, on large projects involving the development of multiple system components, each component can be treated as a sub-project in its own right.

You will find out more about each phase of the IS project life cycle later in this topic.

The motivations for a project may come from problems with an existing solution or situation, a pressing business issue, a change in business strategy or the fact that competitors are using technology to gain competitive advantage. Preparing a strong business case for a project is part of developing a project proposal.

**Preparing the business case**

You need to consider the following points while preparing the business case.

1. Is the project strategically aligned to the business?
2. What are the specific benefits (e.g., revenues, customers, savings etc.)?
3. What are the options and how has a particular solution been selected?
4. What resources are needed over what timeframe?
5. What are the key risks?

**Evaluating a project proposal**

Project proposals are also evaluated on measures of cost, time and performance.

Click each tab to know more about these measures.

**Project proposal evaluation measures**

**Cost**

Cost is concerned with resources being spent as expected. Accurate budgets and benefit estimates are needed to accurately evaluate proposals. They also provide valuable control mechanisms during project implementation.

**Time**

Time is a critical variable in projects. First, it is highly correlated with cost, although in some cases, cost can be reduced by less rushed efforts. Second, delayed benefits are worth much less than early benefits, due to the time value of money. Keeping a project on schedule is a major challenge.

**Performance**

Projects need to perform to specifications and user requirements. Even when a project proposal is approved, there may be some delay before the project actually starts because of budget and planning cycles in the organisation.
3. Specification Phase

Projects start with somebody's problem. Computer systems are powerful tools that solve many problems. Therefore there are many times when they offer improved means of doing things. For instance, the systems analyst needs to start off by talking to the people that proposed the application to find out what they want, and to the people that are budgeting the project to find out the constraints in terms of the cost.

It is best to discuss the proposed project with all groups affected, so that the result is not counterproductive and does not create unexpected problems. After these interviews, a clearer statement of the problem should be developed. The first phase of the project life cycle is therefore the specification phase.

A feasibility study is a clear, concise statement of the problem, followed by a detailed formal description of the current system. Adequate qualitative and quantitative information should be provided to determine if the effort should be continued. The elements and components of the proposed system are identified.

The specification phase should yield a clear problem statement of what the system is intended to do, with a rudimentary idea of a systems solution. Once the initial authorisation is obtained, the system is defined in greater detail. A statement of work specifies what is to be done. This needs to specify new system objectives, and provide measures for the acceptability of the system upon completion.

Performance objectives should not be constrained by the existing system. One approach that works well is to start with general objectives. Objectives should include sub elements that are measurable. This phase of the systems development cycle results in a comprehensive list of activities, along with their schedules, costs and required resources. This includes hardware and software requirements. When presented with the costs of proposed systems, many are rejected. It is in the specifications phase that most projects die.

Aligning specifications to business needs
There is a growing emphasis on aligning specifications and user requirements in general, to the business needs of the organisation. Requirements traceability captures the relationship between identifiable business needs to individual requirements, and then to the actual specification. Hence, the rationale or justification for a specification is clearly articulated. Where there is a change to the business need, the requirements and specification that this change impacts can be clearly traced. Equally, where there is a change to a specification, the business need for this change can be traced upwards. Business needs and requirements can be assigned "owners", so that accountability for any changes in business need and requirements can be determined.

Hence, IS projects are driven by the business needs and requirements of the organisation. There are a number of requirements management tools on the market that support the management of requirements in this way, such as DOORS and Rational RequisitePro.

4. Design Phase

Now let us look at the second phase of the IS project life cycle, the design phase. The design phase shows how software will meet requirements. One of the classic business analyses is the decision to make or buy. This decision is very pertinent to computer systems, because there are many vendors that produce and sell many useful computer systems (often referred to as off the shelf, or OTC for 'over the counter').

Every organisation has the option of either buying products from vendors, or building the product themselves. In general, buying products from vendors is much less of a hassle. But you have to live with the features that the vendors add to the product. Vendors may also charge more than what the product is worth. But building products
in-house requires a lot more risk and time. If required expertise is not available, it may well be worth spending a little more on the vendor. Usually the vendor route is faster, and quite often it is cheaper. The problem usually lies with matching the existing system.

Outsourcing

It has become very popular to hire out large portions of information processing, or outsourcing. One purpose of outsourcing is to reduce labour expense. Another is to obtain highly-skilled expertise from others without having to go through development pains. The following article describes why many companies are now turning to IT outsourcing.

Reading: IT Outsourcing

- For more information on why many companies are now turning to IT outsourcing, read the article below. "Outsourcing various IT functions becoming practical for companies." Asia Africa Intelligence Wire (July 13, 2004).
- For an introductory FAQ on outsourcing, see the following article from cio.com, ABC: An introduction to outsourcing

The usual approach is to outsource those activities that others do better and retain those activities that are key to organisational strategy.

Reading: Outsourcing

- In 1996, GM signed on with EDS to provide the bulk of its information-technology needs under a 10-year pact worth a total of $30.6 billion. Read the following article to find out what happened when that contract expired. "GM Outsourcing Overhaul, 1 Year Later", Baseline 1 no.68 (Jan 2007).

Many functions can be outsourced, including data centre management, telecommunications, disaster recovery and legacy systems maintenance. This avoids wastage of scarce resources and gains efficiencies by hiring vendors with expertise. Outsourcing can also be used for company Internet operations. However, Eastman Kodak, which used outsourcing heavily, held on to its Internet activities because the environment was too dynamic and its own plans were too uncertain. If plans are clearer, Internet functions that could be outsourced include connectivity, Web server hosting, firewall security, web-site development and content development. Such activities may not be particularly relevant to organisational core competencies, and so would be appropriate to consider outsourcing.

Outsourcing makes sense when fast start-up is important, internal skills are lacking and the vendor can provide strong features. Outsourcing is not as worthwhile if the function is of strategic importance to the business, or requirements are ill-defined. Rarely is outsourcing used for everything involved within a project. There will always be a need for internal training to implement the system and to integrate it with the existing system.

If vendors or outside contractors are being considered, a request for proposal is required, including the feasibility study and the plan for project development. The request for proposal states the user requirements in terms of system objectives, project scope and performance specifications, as well as constraints, especially in terms of time. It is necessary to develop a qualified bidders list of those with the ability to accomplish the work required.
The project team needs to be selected at this stage. The project manager should be selected, with characteristics we will discuss later. Team members are drawn from functional areas. Functional managers should be sold on the project, so that good team members are obtained.

The output of the design phase is a detailed list of user requirements and system requirements. Tasks are broken down into work packages and team members are given specific assignments. The project manager is responsible for setting up schedules, budgets and controls.

The output of the design phase is a task break-out, with each task scheduled by date. It is necessary to continue close co-ordination between the systems analyst, the ultimate user of the system and the budget authority. A project is never completely designed nor finally adopted, until it is complete. A more accurate understanding between the analyst, the user and the owner is necessary to develop systems that are useful and cost effective.

5. Coding (or Acquisition) Phase

Now let us look at the third phase of the IS project life cycle, the coding (or acquisition) phase. You need to evaluate whether the options are in-house or vendor contracted. If in-house, the conventional phase of coding is applied to implement the design. If options including purchasing the products or services of a vendor are adopted, the term 'acquisition' seems more appropriate.

Click each tab to know more about acquisition and in-house coding.

**Coding Phase: acquisition or in-house**

**Acquisition**

If outside vendors or contractors are being considered, the selection of the bidder to build the project (or project components) involves some options. There are a number of bases for selecting a bidder. If the system quality has been thoroughly defined to the extent that every bidder has the knowledge and if each bidder has been screened to ensure their competence, selection on the basis of a low bid is usually used. This has obvious advantages, using the competitive system, to lower costs. However, selecting the low bidder has obvious risks if the bidder is not truly qualified.

In fact, in some parts of Europe, the winning bidder is the one closest to the average bid, using the logic that they must know what they were asked to do. Regardless, there are a number of important considerations, such as:

- Cost - need to ensure that it is within the allowable budget
- Feasibility - need to ensure that the bidder can actually do the project
- Experience - look at the bidder's record on similar projects
- Reputation - bidder's record with respect to quality work

Oftentimes, if the bid is too high, the user can negotiate with the bidder. There is a degree of ethics involved if an open competitive bidding process was used. Those not selected may not have been treated fairly if the rules are changed after the initial bid. However, in the private sector, this is a legal way to proceed, and the owner and
The bidder can work together to negotiate an acceptable agreement for both. Negotiation is especially appropriate when dealing with complex systems when it is attractive to share risks.

**In-house coding**

In-house systems development begins with the design phase, which involves converting specifications from the definition phase into plans. The proposed system is broken down into subsystems, components and parts.

All elements need to be checked for compatibility, as well as for their ability to meet specifications. Prototyping can be used if there is benefit from seeing what the system will look like.

The system is developed and the necessary hardware and software is procured. Then the system is constructed, and the necessary code and interfaces are programmed. This is followed by system testing that is conducted concurrently with assembly of the system to detect errors as quickly as possible. Development of training materials is often accomplished concurrently as well.

**Cost/benefit study**

A cost/benefit study is often used to evaluate projects. This study is based on a preliminary and high-level estimate of project cost and benefits. If bids are taken, the acquisition cost is pretty well defined. Costs to implement and operate the system need to be considered as well.

View this animation that describes how the cost/benefit ratio is used.

Cost/benefit study

Cost/benefit study

Alternate Text

Cost/benefit study

The cost side of the ratio is usually much easier to accurately measure than the benefits. System performance standards are often used as the basis for estimating the value of expected benefits. Everything connected with the project needs to be put in dollar (or whatever currency) terms to use the cost/benefit ratio, which is nothing more than the net present value of the proposed project.

Cost/benefit ratios have the advantage of clearly identifying if proposals make economic sense. If the net present value of the benefits exceed the net present costs associated with the project, adopting the project should improve the financial position of the organisation. If there is a budget for only a limited number of projects, the proposals could be ranked by the cost/benefit ratio. The concept is very good, but it depends on the accuracy of the numbers used in the calculations, which
often involves high degrees of uncertainty.

Production

The production of a system follows analysis and design. The production itself can involve a large group of diverse people, from programmers, people building user interfaces, people designing the database interfaces, people dealing with the users to design reports, and people to set up any required networks for multiple users. The project manager must consider obtaining people with the right skills to be available at the right time, obtaining needed facilities in terms of tools and places to work, realistic time estimates allowing for the appropriate level of uncertainty and, of course, capital.

Quality testing should be accomplished throughout production. It is a good practice to build systems in modules and thoroughly test each component before adoption. If at all possible, it would be best to include the user in this testing.

6. Data Conversion Phase

Now let us look at the fourth phase of the IS project life cycle, the data conversion phase. When a system is developed, data access and inputs need to be compatible with the new system. An extreme example of this problem occurs in data mining, where masses of raw data are processed with the intent of obtaining insight into more effective ways of running a business. Data for data mining is almost always stored in data warehouses, capable of storing mammoth quantities of input, such as cash register data.

Data conversion is important because for data mining to work, data must be in a usable form, to include having no missing observations, having all data in numeric form, and readable in the proper format. A major element of data warehousing is cleaning data to obtain this state. Executive information systems and enterprise resource planning systems also require data to be converted to a compatible form.

7. Testing Phase

Now let us look at the fifth phase of the IS project life cycle, the testing phase. Quality control is very important throughout the system development cycle. Testing is a critical IS project activity and the least predictable with respect to time. This is the stage of the project life cycle where the greatest uncertainty exists. In fact, there is a tendency to think that projects are on schedule until reaching the testing stage. Thus, it is good to begin testing early.
Each module needs to be checked before a block of work is considered complete. Organisations usually have independent testing groups assigned to review system components to ensure that they are capable of dealing with the expected workload.

### 8. Implementation and Maintenance Phase

Now let us look at the sixth phase of the IS project life cycle, the **implementation and maintenance phase**. Once the system is satisfactorily built and tested, it is moved from the builder to the user. This requires that the system be installed and checked to ensure that it does what was specified. Training the users with technical support available once the system is turned over to the user wraps up the project cycle.

The user evaluates system performance and if any flaws are detected, the builder would fix them. Sound contractual agreements spelling out procedures before the project is started are very useful at this stage. Builders often provide maintenance support for systems, usually at some nominal fee.

It should be noted that there are several variations to the IS project lifecycle, including the Waterfall model, Prototyping and the Spiral model. We will look at these variations in detail later in the subject.

### 9. Exercise

Click the link below for an exercise to practise making decisions about project activities in the IS project life cycle.

**Exercise: Project Activities**

Read the scenario given in the exercise. At each point in the scenario, you will be asked to identify appropriate project activities. If you are correct in your identification, you will proceed to the next part of the scenario.

Metro-Banking is a financial institution that wishes to install a new call centre system to improve its customer services operations. The existing call-centre system was very unreliable and often suffered from system failures. Calvin Lee is the head of customer services at Metro-Banking. You are the project manager (PM) for the Advanced Call Centre (ACC) Project.

Calvin Lee contacted you last Tuesday about some of the issues he was having with the existing call-centre application. These are his complaints: "The system hangs at least once every week. It’s particularly bad if it happens when we are in the middle
of a call with the customer as the call just gets dropped. Our customers are left wondering what’s happened, and it reflects poorly on our image. I have a hard enough job retaining customers. Some of the call-operators have also complained about the usability of the system, and how hard it is to use all the different functions.”

Q1. Identify the order in which the following activities should take place in order to complete the specification phase of the project.

1. Gain approval for the new system from the senior management team at Metro-Banking and define the new system in greater detail.
2. Prepare a feasibility study that provides adequate quantitative and qualitative information about whether the project for a new call-centre system should be continued.
3. Prepare a statement of work that specifies the objectives of the new call centre system, acceptability criteria and major project milestones.
4. Interview the users of the existing call-centre application to get a clearer statement of the problem to be addressed.

Options as below:
1. 1 -> 2 -> 3 -> 4
2. 4 -> 2 -> 1 -> 3
3. 1 -> 3 -> 2 -> 4
4. 4 -> 1 -> 2 -> 3

The correct answer is
- option 2, 4 -> 2 -> 1 -> 3. It is important to first gather information on user requirements, which will enable you to decide on the feasibility of a new system and identify the statement of work. Only then can you present your case for approval.

You have gained a good understanding of the functionality required of the new call-centre system and when the new system will be required. The users of the call-centre system have also included some additional requirements not currently supported by the existing call-centre application.

However, the functionality of the new system is non-trivial. Calvin wants the new system to be ready in nine months. Developing the system from scratch might take easily over 12 months, and this would mean the project would surely overrun its schedule completion date.

Q2. What would be two possible strategies to consider at this stage in the project (select from the list)?

1. Evaluate off-the-shelf call-centre systems from different vendors, taking into account the functional fit between these packages and Metro-Banking’s requirements.
2. Re-scope the project so that the requirements are less demanding and the project can be delivered within the timeframe.
3. Write a request for a proposal to outsource the project to a vendor who is able to deliver the new call-centre system within the required timeframe and budget.
4. Tell Calvin that the new system can only be ready in 12 months and there is no way around it.

The correct answers are as follows:
- option 1, Evaluate off-the-shelf call-centre systems from different vendors, taking into account the functional fit between these packages and Metro-
Banking’s requirements

- option 3. Write a request for a proposal to outsource the project to a vendor who is able to deliver the new call-centre system within the required timeframe and budget

You decided to evaluate a number of off-the-shelf call-centre systems provided by a range of different vendors as you feel that offers the best approach. Calvin has seen one particular off-the-shelf call-centre system, “InterCall”, that he liked very much at a recent tradeshow.

Calvin: "InterCall looks really good. The interface is clean and uncluttered. I know the call-centre staff at Metro-Banking would love it. It’s also got some nice features, like call-centre productivity monitoring, that I can use to monitor the productivity of our call-centre operations. Right now, the existing system we have doesn’t support this at all."

You identify the market leaders for call-centre systems as well as a number of smaller vendors through searches on the Web. You discover that there are over 30 different vendors offering off-the-shelf call-centre systems.

Q3. Which two activities would be the most sensible to consider at this stage in the project? Identify their sequence.

Select the off-the-shelf call-centre system that is offered by the vendor at the lowest cost.

Select the Intercall off-the-shelf system.

| Use the criteria to shortlist a small number of off-the-shelf call-centre systems to conduct more in-depth investigations and demos. |
| Identify the key selection criteria, such as functional fit, cost and stability of the off-the-shelf system and vendor reputation. |

After evaluating a number of off-the-shelf call-centre systems, you eventually select the "TriStar Call-Centre" system, which appears to best suit project requirements. Calvin agrees that TriStar is a superior system to Intercall. At this stage of the project, you assemble a project team consisting of several of the Metro-Banking’s senior IT staff. You would also like some real users from the call-centre to serve on the project as well, so you discuss with Calvin to transfer two call-centre staff to the project. You also firm up the project schedule, and identify more detail tasks to be assigned to the team members. The project begins to enter the production stage, where the off-the-shelf call-centre system, TriStar will be installed, and additional customisations to the system will be made, if necessary.

Q4. At this stage in the project, you will need to consider a number of different issues. Identify whether the following project activities represent project scheduling, data conversion or testing issues.
After several months of implementation, you and your team manage to develop a new call-centre system using the TriStar system. You are just about ready to rollout the new system, and replace the existing system. At this stage, your team has completed a number of tests on the new system, checking the system for reliability and performance. Earlier on in the project, a number of functional abnormalities were discovered in the system, which have now been rectified. You are now confident that the system is bug-free and ready for live usage.

**Q5.** Which two additional activities need to be done at this final stage of the project?

1. Installing the new system in the live environment and ensuring that it functions correctly.
2. Carrying out usability tests to gather feedback about the user interface from the call-centre staff.
3. Creating user guides and training the call-centre staff on how to use the new system.
4. Conducting a cost-benefit analysis to ensure that the new system is providing real business benefits to Metro-Banking.

The correct answers are as follows:

- option 1, Installing the new system in the live environment and ensuring that it functions correctly.
- option 3, Creating user guides and training the call-centre staff on how to use the new system.

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**10. Business and Organisational Change**

IS projects are rarely just about delivering IS solutions. Seen in a much broader context, IS projects usually result in changes to the way in which an organisation does business (think about how eBusiness systems enable organisations to conduct...
business over the Internet) and changes that affect operational processes, organisational structures and roles and responsibilities. Hence, it is often necessary to consider business and organisational impact as part of an overall solution within which the IS system is just one component.

However, transformation and change is a complex area in its own right, with its own set of theories and concepts.

**Reading: Business and Organisational Change**

Read the following article for more information on a popular model of organisational change, known as Lewin’s Change Model.


**11. Self-Assessment**

Now, try the self-assessment questions to test your understanding of the topic. Click the following link to open the Self-Assessment in a new window.

**Self-Assessment**

Q1. A business case is essential for project justification. Which two of the following define the purpose of a business case?
   1. Describe how the project is strategically aligned to the business
   2. Drive revenue growth
   3. Indicate the key project risks
   4. Provide a project organisation chart

Q2. In general, project life cycle involves activities around the phases of specification, design, coding, data conversion, testing and implementation. Is this statement true or false?
   1. True
   2. False

**12. Summary**

**This topic covered the following main points:**

- The IS life cycle is a sequence of IS project activities, which includes specification, design, coding, data conversion, testing and implementation.
- It is very difficult to successfully accomplish IS projects on all three dimensions of cost, time and functionality simultaneously.
- Specification is key, as a clear understanding of what the system needs to do is needed for a functional IS project.
- There are alternative ways to accomplish a project and the costs and benefits of these alternatives need to be considered carefully.
- Producing the software is usually the most predictable part of a project.
- Care must be given to how the project impacts organisational data and integrates with other organisational software systems.
- Testing is a critical phase of the IS project life cycle. Because of this importance, testing should be started as early as possible. Final testing after project coding is needed as well, but should be more successful given early testing.
- System implementation includes training organisational users, a key element in IS project success.
Reference

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