Chapter 1

Introduction to software project management

Further exercise pointers

1. *List the problems you experienced when you carried out a recent ICT-related assignment. Try to put these problems into some order of magnitude. For each problem consider whether there was some way in which the problem could have been reduced by better organization and planning by yourself.*

   Clearly, this will vary from individual to individual. The precise nature of recent assignments will also have a bearing.

2. *Identify the main types of personnel employed in an information systems department. For each stage of a typical IS development project, list the types of personnel who are likely to be involved.*

   Many undergraduates will have no experience of an actual software or ICT development environment, so will have only a hazy idea of who does what. Another problem is that there is no one right answer as there will be variations depending on the type of environment (e.g. is it an environment where embedded software or, say, an information system is being developed?). It is suggested that tutors elicit the ideas of students about the right people for a particular stage of the project and then have a discussion about some of the broader issues raised.

   Firstly, here are some pointers about who would be involved at which stage.

   Requirements elicitation and analysis
   This might involve: business analysts, systems analysts, sales managers, pre-sales support, sales engineers depending on the environment and the particular circumstances of the project (e.g. is it being developed for an internal or external client?).

The ISO 12207 suggests that 'human factors engineering specifications' would be produced at this stage which implies the deployment of human-computer interface specialists

Other specialists might be involved to deal with other technical areas, for example security.

Note, also, that you would have to have some user and/or client representatives available to provide details of their needs.

Architectural design
System architect – many organizations now have a single person or group that is responsible for ensuring new system components are designed according to organizational standards
Software designers

Detailed design
Software designers, software developers

Code/test
Software designers, software developers

Integration
Software designers, software developers (to deal with problems) hardware designers, testers

Qualification testing
System testers, end-users, software designers and developers (to resolve problems and issues)

Installation
Business analysts, technical support, trainers, local user management

Discussion points

- Why different organizations would have different allocations of responsibility (e.g. because of size, nature of projects, nature of business)
- Roles versus jobs
- What considerations should be taken into account when dividing up work? These would include the types of expertise people have, the desirability of separating area of concern (such as code development and testing); the relative cost of staff (you do not want

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expensive staff spending time on tasks that cheaper staff could do); the additional communication overheads when jobs are split and so on.

3. *A public library is considering the implementation of a computer-based system to help administer book loans at libraries. Identify the stakeholders in such a project. What might be the objectives of such a project and how might the success of the project be measured in practical terms?*

Stakeholders
These could include:

- The local authority who own and pay for the library
    - The political leadership
    - Finance, human resources and other support services
- Library staff at various levels
- Technical support staff
- Software and hardware suppliers
- Library users

Note (a) the stakeholders will vary depending on the implementation approach adopted for the project (b) Library users could be sub-divided into different customer segments, e.g. school children, senior citizens and so on (c) Some stakeholders will be more distant than others: for examples it could be argued that authors might be stakeholders in the loans system as the record of loans of their books could affect their income. However, this would not necessitate having an author as an adviser on the project.

Objectives
You might have something along the lines:
'To have in place an operational computer-based loans management system by dd/mm/yy which meets the requirements specified in Annex X at a development cost of not more than £xxx.'

Discussion points might include:

- There is a hierarchy of concerns and objectives. The objective above is one that the project manager might have to adhere to. Local authority chiefs might have an objective, on the other hand, 'To save £xxx over 3 years on staff costs'. The project manager could not be accountable for the latter objective if he/she will not have any control over staffing after the application is installed.

- Consideration of how some of these other stakeholder objectives will affect the scope of the technical project. Some library staff and users might see an objective of the project to improve access to books by having more effective enquiry and reservation processes – this would need to be included in the documented requirements.

Measures of effectiveness

For example

Was the application actually working by dd/mm/yy?

Were costs under £xxxx?

Can users etc certify that delivered system meets the documented requirements?

4. *A software house has developed a customized order processing system for a client. You are an employee of the software house that has been asked to organize a training course for the end-users of the system. At present, a user handbook has been produced, but no specific training material. A plan is now needed for the project which will set up the delivery of the training courses. The project can be assumed to have been completed when the first training course starts. Among the things that will need to be considered are the following:*
   - *Training materials will need to be designed and created;*
   - *A timetable will need to be drafted and agreed;*
   - *Date(s) for the course will need to be arranged;*
   - *The people attending the course will need to be identified and notified;*
   - *Rooms and computer facilities for the course will need to be provided for.*

   A. *Identify the main stakeholders for this project;*
   B. *Draw up a statement of the objectives for this project;*
   C. *For the objectives, identify the measures of effectiveness;*
   D. *For each objective, identify relevant sub-objectives or goals and who would be responsible for each of them*

Main stakeholders

These might include:

- Client management – concerned that they have an effective accounting system and one aspect of this is that staff can use it effectively; also concerned about costs
- User management – at a lower level than the above, they would share the higher management concerns, but also

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have operational ones such as cover in the office when staff attend training courses.
- Users – they must feel that training is effective and relevant, concerned that it should not be inconvenient in terms of travel, timing etc.
- Trainers – that appropriate training materials are produced that will meet the expectations of users etc.
- Technical support – that a version of the new software is set up in a training environment suitable for use on the courses
- Premises management – availability of rooms for training
- Catering services – to provide refreshments for course delegates
- Reprographics services – to produce copies of training material correctly and on time

Objectives
Something along the lines:
'To have in place by dd/mm/yy all the materials and arrangements needed to enable the delivery of the training courses relating to the user of the accounting package ABC at organization XYZ within the budget specified'.

Note that the actual delivery of the material and training of staff is just outside the boundary of the 'project'.

Measures of effectiveness
An obvious one is that the training courses can actually go ahead. However, this is rather late if things are missing. An alternative would be to produce a checklist that can be used on dd/mm/yy that the necessary arrangements are in place. e.g.
- Rooms and equipment booked
- Delegates notified
- Training materials prepared

Etc., etc

Goals/sub-objectives
The checklist mentioned in the previous section could also be used to identify goals, e.g.

- Rooms booked – training administrator, premises manager
- Dates/ times of course notified to selected delegates – training administrator
- Training materials prepared – trainer

- Catering booked – training administrator, catering manager
- Installed software – technicians
- Training materials copied – reprographics

5. *A manager is in charge of a sub-project of a larger project. The sub-project requires the transfer of paper documents into a computer-based document retrieval system and their subsequent indexing so that they can be accessed via key-words. Optical character readers are to be used for the initial transfer but the text then needs to be clerically checked and corrected by staff. The project is currently scheduled to take twelve months using permanent staff. A small budget is available to hire temporary staff in the case of staff absences through holidays, sickness or temporary transfer to other, more urgent, jobs. Discuss the control system that will need to be in place to control that sub-project.*

   It would need to be established at an early stage whether the number of documents to be transferred is known. This might depend on whether the documents have already been accurately catalogued. If the number is not accurately known then an estimate would be required. Another question is whether there is much variation in the number of pages in each documents. If there is a high degree of variation then it might be better to control on number of pages.

   From the estimates above we can calculate the provisional transfer rate (in pages per day, for example) that would be needed in order to complete the transfer exercise on time.

   Periodically we can collect the following details:
   - Estimated number of documents
   - Estimated number of pages
   - Documents actually processed
   - Pages actually processed

   From this data we can derive the information:

   - Required transfer rate (pages left / time left)
   - Actual transfer rate (pages transferred/ time spent)

   As the project progresses, we should gradually get a more and more accurate idea of the estimate of pages

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If the transfer rate goes down, it could be because staff have been taken away to work on other tasks. A record of the actual hours spent on the transfer project by each member of staff is therefore needed. As there is a fixed budget for the hiring temporary staff a careful record of the actual hours and costs of temporary staff would also be required.

6. *The idea behind a project is that students should be able to access details of available placements via an intranet. When there is a placement opportunity for which they wish to be considered, they would be able to apply for it electronically. This would cause a copy of their CV, which would also be held on-line to be sent to the potential employer.*

Details of interviews and placement offers would all be sent by e-mail. While some human intervention would be needed, the process would be automated as far as possible.

You are required to produce a business case report for such an application which justifies the potential development by showing that the value of its potential benefits outweigh its development and operational costs.

Create lists of the main benefits and costs for the project. You do not have to specify actual figures, just the headings under which they would appear.

This was actually set (with a little more detail) as a group assignment.

Students were encouraged to think about how the potential benefits could be quantified in money terms. In doing this we were certainly not implying that the only benefits that should be considered are those that can be expressed as money. It is just that senior management are more likely to be persuaded by potential financial benefits.

Given that students from different Higher Education Institutions (HEIs) may be competing for the same placements, the following chains of benefits might be hoped for:

- Students able to access and apply for placements at a distance from the physical placements office – could save them travel and inconvenience
- This may also allow faster response to placement offers

- This may increase chance of obtaining desirable placements
- HEIs will generate more fees if students do placement
- Student who do placements will find it easier to get well-paid jobs on graduation
- This will reflect well on the HEI in terms of employment statistics
- Good league table performance will attract more applicants etc.

It will be noted that some possible benefits are more distant and their achievement would be more difficult to verify in reality.

Other benefits could also certainly be identified e.g. possible freeing up of staff time from paperwork, allowing them to pursue a more proactive role to seeking placement opportunities for students.

Costs of the system would include costs of designing and building software, acquiring additional ICT equipment, training, data transfer, explaining and selling the new approach to employers.

7. *Distinguish between software product development and outsourced projects. Explain the key ways in which managing an outsourcing project differs from those of a product development project.*

An outsourced project is a small part of some project,. Outsourced projects are usually small in size and need to be completed within a few months of time.

Outsourced projects may require focusing on certain activities, such as testing, or coding. Thus traditional cost and duration estimation have only restricted use. Also, since he projects are of short durations, they have stringent deadlines. Therefore, monitoring and controlling these projects pose challenges.

8. *Identify the important characteristics of software development projects which make these harder to manage compared to other types of projects; say for example, a building construction project.*

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Invisibility: Software remains invisible, until its development is complete and it is operational. Anything that is invisible, is difficult to manage and control. Consider a house building project. The manager can closely monitor the progress of the project, and take remedial actions if he finds that the progress is not as per plan. In contrast, it becomes very difficult for the manager of a software project to assess the progress of the project due to the invisibility of software. The best that he can do perhaps is to monitor the milestones that have been completed by the development team and the documents that have been produced --- which at best are rough indicators of the progress achieved. Invisibility of software makes it difficult to assess the progress of a project and is a major cause for the complexity of managing a software project.

Changeability: Because the software part of any system is easier to change as compared to the hardware part, the software part is the one that gets most frequently changed. This is especially true in the later stages of a project. As far as hardware development is concerned, any late changes to the specification of the hardware system under development usually amounts to redoing the entire project. This makes late changes to a hardware project prohibitively expensive to carry out. This possibly is a reason why requirement changes are frequent in software projects. These changes usually arise from changes to the business practices, changes to the hardware or underlying software (e.g. operating system, other applications), or just because the client changes his mind. or just because the client changes his mind.

Complexity: Even a moderate sized software has millions of parts (functions) that interact with each other in many ways: data coupling, serial and concurrent runs, state transitions, control dependency, file sharing, etc. Due to the inherent complexity of the functioning of a software product in terms of the basic parts making up the software, many types of risks are associated with its development. This makes managing these projects much more difficult than that for many other kinds of projects.

Uniqueness: Each software project is usually associated with many unique features or situations. This makes every project much different from the others. This is unlike projects in other domains, such as car manufacturing or steel manufacturing where the projects are more predictable. Due to the uniqueness of the software projects, a project manager in the course of a project faces many issues that are quite unlike the others he had encountered in the past. As a result, a software project manager

has to confront many unanticipated issues in almost every project that he manages.

Exact conformity: Mechanical components such as nuts and bolts typically work satisfactorily as long as they are within a tolerance of 1% or so of their specified sizes. However, the parameters of a function call in a program are required to be in complete conformity with the function definition. This requirement not only makes it difficult to get a software product up and working, but also makes reusing parts of one software product in another difficult. This requirement of exact conformity of the parameters of a function introduces additional risks and contributes to the complexity of managing software projects.

Team-oriented, intellect-intensive work: Software development projects are akin to research projects in the sense that they both involve team-oriented, intellect-intensive work. In contrast, projects in many domains are labour-intensive and each member works in a high degree of autonomy. Examples of such projects are planting rice, laying roads, assembly-line manufacturing, etc. In a software development project, the work is not only highly intellect intensive, but each member has to typically interact, review, and interface with several other members, constituting another dimension of complexity of software projects.

9. What is the difference between a method and a methodology? What are the essential items that must be planned before carrying out a method or methodology?

   A method describes the types of activities that need to be undertaken to perform some work. Whereas, many methods are grouped form a methodology. In that sense, a methodology is more generic or abstract than a method. The plan pertains to the start and end dates of the activities, who would carry it out, and what tools and materials, including information, would be needed.

10. *Identify the main differences between managing the development of a conventional project and an outsourced project.*

    Since an outsourced project is a small part of some project, outsourced projects are usually small in size and need to be completed within a few months of time. Considering these differences between an

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outsourced project and a conventional project, managing an outsourced project presents special challenges.

11. *Identify the key aspects in which modern software project management practices differ from those of the traditional software project management.*

- **Planning incremental delivery:** Few decades back, projects were much simpler and therefore more predictable than the present day projects. In those days, projects were planned with sufficient detail, much before the actual project execution started. After project initiation, monitoring and control activities were carried out to ensure that the project execution proceeded as per plan. Now, projects are of much shorter duration and rapid application development and deployment are considered key strategies. The traditional long-term planning has given way to adaptive short-term planning. Rather than making a long term project completion plan, the project manager now plans all incremental deliveries with evolving functionalities. This type of project management is often called *Extreme* project management. The extreme project management is a highly flexible approach to project management that and concentrates on human side of project management (e.g. managing project stakeholders), rather than on formal and complex planning and monitoring techniques.

- **Quality management:** Of late, customer awareness about product quality has increased significantly. Tasks associated with quality management have become an important duty of the project manager. The key responsibilities of a project manager now therefore includes assessment of project progress and tracking the quality of all intermediate artifacts.

- **Change management:** Earlier, after the requirements were signed off by the customer, any changes to the requirements were rarely entertained. Customer suggestions are now actively being solicited and incorporated throughout the development process. To

facilitate customer feedback, incremental delivery models are popularly being used. Product development is being carried out through a series of product versions implementing increasingly greater functionalities, also customer feedback is solicited on each version for incorporation. This has made it necessary for an organization to keep track of the various versions and revisions through which the product develops. Another reason for the increased importance of keeping track of the versions and revisions is the following. Application development through customization has become a popular business model. Therefore existence of a large number of versions of a product and the need to support these by a development organization have become common. In this context, the project manager plays a key role in product baselining and version control. This has made *change management* a crucial responsibility of the project manager.

12. *Explain the major activities carried out by a software project manager and the order in which these are carried out.*

The principal activities of a software project manager include project planning, monitoring, and control. The time period during which these activities are carried out is indicated in the following figure. It can be seen in figure that regardless of the specific methodology used, project management is carried out over three well-defined stages or processes. In the project initiation stage, an initial plan is made. As the project start, the project is monitored and controlled to proceed as per the plan. But, the initial plan is refined from time to time to factor in additional details and constraints about the project become available. Finally, the project is closed. In the project closing stage, all activities are logically completed and all contracts are formally closed. The following are the activities that are undertaken during project planning.

Estimation: The following project attributes are estimated.

- **Cost:** How much is it going to cost to complete the project?
- **Duration:** How long is it going to take to complete the project?
- **Effort:** How much effort would be necessary for completing the project?

The effectiveness of all later planning activities such as scheduling and staffing depend on the accuracy with which the above three project parameters have been estimated.

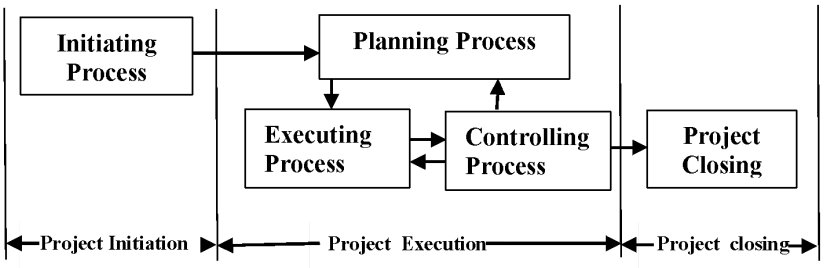
Scheduling: Based on the effort and duration estimations, the schedules for manpower and other resources are developed.

Staffing: Staff organization and staffing plans are made.

Risk management: This activity includes risk identification, analysis, and abatement planning.

Miscellaneous plans: This includes making several other plans such as quality assurance plan, configuration management plan, etc.

Project monitoring and control activities are undertaken after the development activities start. The focus of project monitoring and control activities is to ensure that the software development proceeds as per plan. While carrying out project monitoring and control activities, a project manager may sometimes find it necessary to change the plan to cope up with specific situations at hand as well as to make the plan more accurate as more project data become available.



13. *Identify the factors that make software projects much more difficult to manage, compared to many other types of projects such as a project to lay out a 100 km concrete road on an existing nonconcrete road.*

Invisibility When a physical artefact such as a bridge is constructed, the progress can actually be seen. With software, progress is not immediately visible. Software project management can be seen as the process of making the invisible visible.

Complexity Per dollar, pound or euro spent, software products contain more complexity than other engineered artefacts.

Conformity The 'traditional' engineer usually works with physical systems and materials like cement and steel. These physical

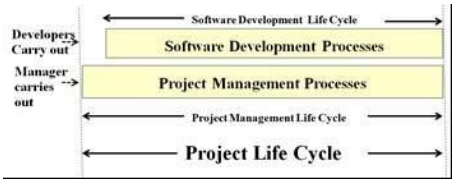
systems have complexity, but are governed by consistent physical laws. Software developers have to conform to the requirements of human clients. It is not just that individuals can be inconsistent. Organizations, because of lapses in collective memory, in internal communication or in effective decision making, can exhibit remarkable 'organizational stupidity'.

Flexibility That software is easy to change is seen as a strength. However, where the software system interfaces with a physical or organizational system, it is expected that the software will change to accommodate the other components rather than vice versa. Thus, software systems are particularly subject to change.

14. *What do you understand by the terms software development life cycle and software project management life cycle? Using a suitable schematic diagram explain the temporal relationship between the software development life cycle and the project management life cycle.*

Software development life cycle denotes the stages through which a software is developed. During the software development life cycle, starting from its conception, the developers carry out several processes (or development methodologies) till the software is fully developed and deployed at the client site. A few examples of the development processes undertaken by the development team include requirements gathering and analysis, requirements specification, architectural design, detailed design, coding, and testing.

In contrast to the software development life cycle (SDLC), the project management life cycle typically starts well before the software development activities start and continues for the entire duration of the SDLC. During the software project management life cycle, the software project manager carries out several project management processes (or project management methodologies) to perform the required software project management activities. The temporal relationship between the software development life cycle and the project management life cycle is shown in the following schematic diagram. The project management life cycle starts before the software development life cycle.



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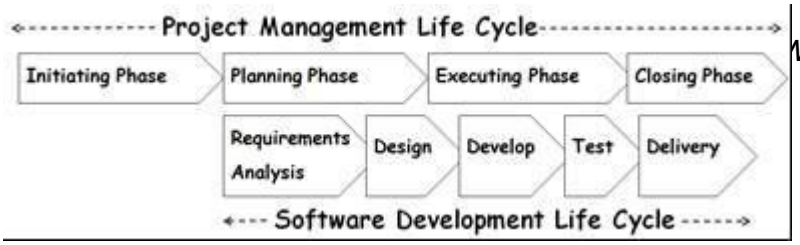
By the time the software development processes start, the initiation phase of the software project management life cycle is almost complete. This aspect is shown in the following diagram.



What are the different phases of the software development life cycle and software project management life cycle? Explain the sequencing of the phases in these two life cycles using a schematic diagram.

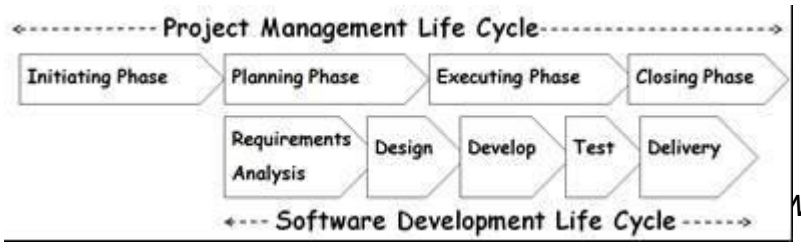
The different phases of the software development life cycle are:

- Requirements analysis
- Design
- Development
- Testing
- Delivery

The different phases of software project management life cycle are:

- Project initiation
- Project planning
- Project execution
- Project closure

The sequencing of the phases of software development life cycle and project management life cycle are shown below:



What do you understand by W5HH principle? Explain the significance of this principle.

Boehm suggested that that during project initiation, the project champions should have comprehensive answers to a set of key questions pertaining to the project. The name of this principle (W5HH) is an acronym constructed from the first letter of each question. These set of seven questions is the following:

- Why is the software being built?
- What will be done?

- When will it be done?
- Who is responsible for a function?
- Where are they organizationally located?
- How will the job be done technically and managerially?
- How much of each resource is needed?

The significance W5HH principle is that various aspects of the project must be thoroughly understood by the project champions, before the project is initiated. The answers to the above questions expected to lead to the definition of key project characteristics.

17. *What is a project charter? What purpose does it serve? Who usually writes this document and at which point in the project management life cycle is this document produced?*
Project charter is an important high-level document that authorizes the starting of a project and use of the required resources. Besides, it outlines the project objectives, deliverables, and the resources required. It also documents the aspects that are out of scope, and identifies the main stakeholders, their roles and responsibilities. A project charter document is usually developed for all types of projects, irrespective of whether it is an in-house project, or a project undertaken on behalf of some customers. The project charter is signed and issued by a member of the top management of the company who also takes up the role of the sponsor of the project. The project sponsor champions the project, monitors the progress of the project and provides regular feedback to the project manager, and helps in removing any obstacles that the project manager may find difficult overcome.

The project manager for a project is usually appointed before the project charter is issued and undertakes to write the project charter in consultation with the project sponsor.

18. *Differentiate between software product development projects and software services projects. What are the important differences between their characteristics? Why are software services projects becoming much more common?*
. A software product development project concerns developing the software by keeping the requirements of the general customers in mind and the developed software is usually sold off-the-shelf to a large number of customers. A software product development project can further be classified depending on whether it concerns developing a generic product or a domain specific product. A generic software product is sold to a broad spectrum of customers and is said to have a horizontal market.

Software services on the other hand, cover a large gamut of software projects such as customization, outsourcing, maintenance, testing, and consultancy. At present, there is a rapid growth in the number of software services projects that are being undertaken world-wide and software services are poised to become the dominant type of software projects. One of the reasons behind this situation is the steep growth in the available code base. Over the past few decades, a large number of programs have already been developed. Available programs can therefore be modified to quickly fulfil the specific requirements of any customer. At present, there is hardly any software project in which the program code is written from scratch, and software is being mostly developed by customizing some existing software. For example, to develop a software to automate the payroll generation activities of an educational institute, the vendor may customize an existing software that might have been developed earlier for a different client educational institute. Due to heavy reuse of code, it has now become possible to develop even large software systems in rather short periods of time. Therefore, typical project durations are at present only a couple of months and multi-year projects have become very rare.

19. *Identify the important differences in the characteristics of the software development projects that are being undertaken now with those that were undertaken several decades back. What can be the possible reasons for the drastic shrinkage of the project durations from multi-year to a couple of months now?*

    Over the last few decades, the characteristics of software projects have undergone drastic changes. For example, in the initial years of software development almost every software was being entirely written from scratch. A possible reason for this could be that in those early days of software development, not many programs were available from which code could be reused in a new software development project. As a result, the entire code for every project had to be written from scratch. Further inhibiting code reuse was the fact that the programming paradigms that existed in those days, hardly provided any support for code reuse. In contrast, at present almost every programming language supports several ways of reusing existing code, including elegant ways of customizing and extending existing code, efficiently and dynamically linking library routines, and support for frameworks.

    A large number of projects that are being undertaken now are essentially customization of some existing software or development

for a new release of an existing software. In these projects, much of the code of the developed software comes from reused code and only a small part of the code is actually written by the development team. Consequently, project durations have now shrunk to only a few months compared to multi-year projects that were being undertaken till about a few decades back. Further, in the past customer participation in software projects was largely restricted to only the initial interactions for requirements gathering and specification and later on completion of the project, taking delivery of the developed software. In contrast, at present customer participation in almost every aspect of a project is being actively encouraged and often a few customer representatives are being included in the development team.

At present, there is hardly any software project in which the program code is written from scratch, and software is being mostly developed by customizing some existing software. For example, to develop a software to automate the payroll generation activities of an educational institute, the vendor may customize an existing software that might have been developed earlier for a different client educational institute. Due to heavy reuse of code, it has now become possible to develop even large software systems in rather short periods of time. Therefore, typical project durations are at present only a couple of months and multi-year projects have become very rare.

20. *Explain the important activities that are carried out during the initiation phase of a software development project.*

The project initiation phase usually starts with project concept development. During concept development the different characteristics of the software to be developed are thoroughly understood. The different aspects of the project that are investigated and understood include: the scope of the project, project constraints, the cost that would be incurred, and the benefits that would accrue. Based on this understanding, a feasibility study is undertaken to determine whether the project would be financially and technically be feasible. This is true for all types of projects, including the in-house product development projects as well as the outsourced projects. For example, an organization might feel a need for a software to automate some of its activities, possibly for more efficient operation. Based on the feasibility study, the business case is developed. Once the top management agrees to the business case, the project manager is appointed, the project charter is written, and finally the project team is formed. This sets the ground for the manager to start the project planning phase.

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21. *Briefly explain the differences between different bidding processes: request for proposal (RFP), request for quotation (RFQ), request for information (RFI), and request for tender (RFT). Explain their applicability to specific project situations using suitable examples.*

Once an organization's top management is convinced by the business case, the project charter is developed. For some categories of projects, it may necessary to have a formal bidding process to select a suitable vendor based on some cost-performance criteria. If the project involves automating some activities of an organization, the organization may either decide to develop it in-house or may get various software vendors to bid for the project. We briefly mention the different types of bidding techniques and their implications and applicability.

• **Request for quotation (RFQ):** An organization advertises an RFQ if it has good understanding of the project and the possible solutions. While publishing the RFQ, the organization would have to mention the scope of the work in a statement of work (SOW) document. Based on the RFQ different vendors can submit their quotations. The RFQ issuing organization can select a vendor based on the price quoted as well as the competency of the vendor. In government organizations, the term request for tender (RFT) is usually used in place of RFQ. RFT is similar to RFQ, however in RFT the bidder needs to deposit a tender fee in order to participate in the bidding process.

• **Request for proposal (RFP):** Many times it so happens that an organization has reasonable understanding of the problem to be solved, however it does not have a good grasp of the solution aspects. That is, the organization may not have sufficient knowledge about the different features are to be implemented, and may lack familiarity with the possible choices of the implementation environment such as databases, operating systems, client-server deployment, etc. In this case, the organization may solicit solution proposals from vendors. The vendors may submit a few alternative solutions and the approximate costs for each solution. In order to develop a better understanding, the requesting organization may ask the vendors to explain or demonstrate their solutions. It needs to be understood that the purpose of RFP is to get an understanding of the alternative solutions possible that can be deployed and not vendor selection. Based on the RFP process, the requesting organization can form a clear idea of the project solutions required, based on which it can form a statement work (SOW) for requesting RFQ from the vendors.

• **Request for Information (RFI):** An organization soliciting bids may publish an RFI. Based on the vendor response to the RFI, the organization can assess the competencies of the vendors and shortlist the vendors who can bid for the work. However, it must be noted that vendor selection is seldom done based on RFI, but the RFI response from the vendors may be used in conjunction with RFP and RFQ responses for vendor selection.

22. *What is meant by the terms gold plating and scope creep? Explain the difference between these two and briefly mention why the project manager needs to guard against those.*

    An over enthusiastic project team member may suggest to add features that are not required by the customer. Such scope change requests originated by the overenthusiastic team members are called gold plating and should be discouraged if the project is to succeed. The customer may also initiate scope change requests that are more ornamental in nature or at best can be non-essential. These serve only to jeopardize the success of the project, while not adding any perceptible value to the delivered software. Such avoidable scope change requests originated by the customer are termed as scope creep. To ensure the success of the project, the project manager needs to guard against both gold plating and scope creep. Otherwise, there can be schedule delays and project cost escalations.

23. *What do you understand by project scope management? Why is this activity crucial to the success of a project?*

    Once a project gets underway, many requirement change requests usually arise. Some of these can be attributed to the customers and the others to the development team. As we have already mentioned, modern development practices encourage the customer to come up with change requests. While all essential changes must be carried out, the superfluous and ornamental changes must be scrupulously be avoided. However, while accepting change requests, it must be remembered that the three critical project parameters: scope, schedule, and project cost are interdependent and are very intricately related. If the scope is allowed to change extensively, while strictly maintaining the schedule and cost are, then the quality of the work would be the major casualty.

24. *What do you understand by the term release management? Why this activity is considered important?*

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It is desirable for a software development project to deploy a suitable release management process. A release management process systematizes the work carried out by the developers to provide a new release of a software and on the part of the users to smoothly and effortlessly obtain and use a new release. The release management process has become especially important after it has become possible for the users to instantly and effortlessly download new releases of a software over the Internet. The release process should involve minimal effort on the part of the developer to upload a new release of a software and on the part of the users to effortlessly download and install it. For example, when a new version of a system is to be released, a tool should automatically determine the changed components, the dependencies, and all interdependent components should be retrievable as a group, so that there is no possibility of inconsistency. There would be significant chance for inconsistency and considerable amount work to be carried out by the user, if the user would have to decide which specific components need to be downloaded. Further, retrievals of unnecessary and unchanged components should be avoided.

25. *Name the different types of plans prepared by a project manager during the project planning stage.*

During the project planning phase, the project manager carries out several processes and creates the following plan documents:

- **Project plan:** This document identifies the project tasks, and a schedule for the project tasks that assigns project resources and time frames to the tasks.
- **Resource plan:** It lists the resources, manpower, and equipments that would be required to execute the project.

- **Financial plan:** It documents the plan for manpower, equipment, and other costs.

- **Quality plan:** Plan of quality targets and control plans are included in this document.

- **Risk plan:** This document lists the identification of the potential risks, their prioritization, and a plan for the actions that would be taken to contain the different risks.

26. *At what point in the project lifecycle should the business case be prepared?*

i. d	iii. b	v. c
ii. d	iv. c	vi. c

vii. c
viii. d
ix. a
x. c
xi. d
xii. c

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