KASNEB - DICT

Information Systems Project Skills

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CHAPTER 1

OVERVIEW OF AN INFORMATION SYSTEMS PROJECT

Definition

An individual or collaborative enterprise that is carefully planned and designed to achieve a particular aim

Planned set of interrelated tasks to be executed over a fixed period and within certain cost and other limitations.

Basic principles of project management

While every project is unique in its own way, there are certain basics which define most project work. These are:

- objectives
- constraints
- lifecycle

Every project takes place in its own **specific context**. A project may be stand-alone, part of a greater body of work, or it could be one in a series of projects. It may bring together a project team a group of people who have never worked together before or new roles to people. All of

these factors need to be identified and considered in order for a project to be completed successfully.

It's important to remember that the level of detail you need at the various project stages should remain appropriate for the size and complexity of the project.

Defining your project objectives

The main point of any project is to achieve specified business goals and objectives. Once these objectives have been fulfilled, the project is disbanded. In most cases the work will be handed over into normal operations. It is therefore vital to any project that the goals and objectives required are **clearly defined**, **measurable and achievable**. Without this, any project is likely to suffer from a lack of focus and an increased chance of failure.

Once objectives have been established, they should be clearly communicated and agreed with all staff and stakeholders on the project.

Understanding your project constraints

A constraint is any factor which can limit or have an impact on a project.

Typical constraints are funding, the scope of the project, available resources and time. It is important to understand what the constraints of any project are in order to clearly **define the boundaries** in which project work must be done.

Projects which do not honour their constraints are often regarded as failures and tend to incur a significant cost to their business.

Project lifecycle

Projects have a definite **start and finish point** within which their objectives need to be fulfilled. This is known as the project lifecycle. While this is usually defined by a start and finish date, the lifecycle of a project can also be defined by a finite resource such as money or a fixed amount of staff time available to the project.

Any successful project will deliver its goals and objectives while honouring its constraints, and by definition do so within the lifecycle of the project.

What Is Project Management?

Project Management is the process of achieving project objectives (schedule, budget and performance) through a set of activities that start and end at certain points in time and produce quantifiable and qualifiable deliverables.

Purposes of project management

Successful project management is the art of bringing together the tasks, resources and people necessary to accomplish the business goals and objectives within the specified time constraints and within the monetary allowance. Projects and Programs are linked directly to the strategic goals and initiatives of the organization supported.

Project Team Roles and Responsibilities

Successful projects are usually the result of careful planning and the talent and collaboration of a project's team members. Project can't move forward without each of its key team members, but it's not always clear who those members are, or what roles they play. Here, we'll describe five roles – project manager, project team member, project sponsor, executive sponsor and business analyst – and describe their associated duties.

Project Manager

The project manager plays a primary role in the project, and is responsible for its successful completion. The manager's job is to ensure that the project proceeds within the specified time frame and under the established budget, while achieving its objectives. Project managers make sure that projects are given sufficient resources, while managing relationships with contributors and stakeholders.

Project manager duties:

- Develop a project plan
- Manage deliverables according to the plan
- Recruit project staff
- Lead and manage the project team
- Determine the methodology used on the project
- Establish a project schedule and determine each phase
- Assign tasks to project team members
- Provide regular updates to upper management

Project Team Member

Project team members are the individuals who actively work on one or more phases of the project. They may be in-house staff or external consultants, working on the project on a full-time or part-time basis. Team member roles can vary according to each project.

Project team member duties may include:

- Contributing to overall project objectives
- Completing individual deliverables
- Providing expertise
- Working with users to establish and meet business needs
- Documenting the process

Project Sponsor

The project sponsor is the driver and in-house champion of the project. They are typically members of senior management – those with a stake in the project's outcome. Project sponsors work closely with the project manager. They legitimize the project's objectives and participate in <u>high-level project planning</u>. In addition, they often help resolve conflicts and remove obstacles that occur throughout the project, and they sign off on approvals needed to advance each phase.

Project sponsor duties:

- Make key business decisions for the project
- Approve the project budget
- Ensure availability of resources
- Communicate the project's goals througout the organization

Executive Sponsor

The executive sponsor is ideally a high-ranking member of management. He or she is the visible champion of the project with the management team and is the ultimate decision-maker, with final approval on all phases, deliverables and scope changes.

Executive sponsor duties typically include:

- Carry ultimate responsibility for the project
- Approve all changes to the project scope
- Provide additional funds for scope changes
- Approve project deliverables

Business Analyst

The business analyst defines needs and recommends solutions to make an organization better. When part of a project team, they ensure that the project's objectives solve existing problems or enhance performance, and add value to the organization. They can also help maximize the value of the project deliverables.

Business analyst duties:

- Assist in defining the project
- Gather requirements from business units or users
- Document technical and business requirements
- Verify that project deliverables meet the requirements
- Test solutions to validate objectives

Information systems project environment

The Shared Information System Environment in project implements in support to improve environmental monitoring and data and information sharing.

In particular, it contributes to:

- Identifying or further developing environmental indicators and scorecards.
- Improving capacities in the field of monitoring, collection, storage, assessment, and reporting of environmental data.
- Setting up national and regional environmental information systems in the countries of the European Neighbourhood Policy area that are in line with the EU Shared Environmental Information System (SEIS).
- Tracking progress of the regional environmental initiatives

Key characteristics of a project

While no two projects are identical, there are three key characteristics that all projects possess. These characteristics must always be considered when making a decision within a project and also provide constraints to the delivery of the objective.

These seven characteristics are;

- 1. A single definable purpose, end-item or result. This is usually specified in terms of cost, schedule and performance requirements.
- 2. Every project is unique. It requires the doing of something different, something that was not done previously. Even in what are often called "routine" projects such as home construction, the variables such as terrain, access, zoning laws, labour market, public services and local utilities make each project different. A project is a one-time, once-off activity, never to be repeated exactly the same way again.
- 3. **Projects are temporary activities.** A project is an ad hoc organization of staff, material, equipment and facilities that is put together to accomplish a goal. This goal is within a specific time-frame. Once the goal is achieved, the organization created for it is disbanded or sometimes it is reconstituted to begin work on a new goal (project).

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CHAPTER 3

PROJECT SCOPE MANAGEMENT

Introduction to Project Scope Management

Project Scope Management refers to the set of processes that ensure a project's scope is defined and mapped accurately. Scope Management techniques allow project managers and supervisors to allocate just the right amount of work necessary to complete a project successfully. It is primarily concerned with controlling what is and what is not part of the project's scope.

In project management, the term scope has two distinct uses: Project Scope and Product Scope.

Scope involves getting information required to start a project, and the features the product would have that would meet its stakeholders requirements.

- Project Scope: "The work that needs to be accomplished to deliver a product, service, or result with the specified features and functions."
- Product Scope: "The features and functions that characterize a product, service, or result."

Notice that Project Scope is more **work-oriented** (the hows), while Product Scope is more oriented toward <u>functional requirements</u> (the whats).

What is Scope?

Scope refers to the detailed set of deliverables or features of a project. These deliverables are derived from a project's requirements.

The definition of Scope follows from the decision of setting out the work to be completed during the lifecycle of a project. Included in this is also the identification of work that will not be counted in the ongoing round of the service/product development.

The resources and work that goes into the creation of a product or service is essentially what defines the scope of the project. The scope generally outlines the goals to be met to achieve a satisfactory result. It is important for project managers to understand how to define the scope of the project.

Steps for defining the scope of a project

To define the scope of the project, it is important to identify the following:

- Project objectives
- Goals

- Sub-phases
- Tasks
- Resources
- Budget
- Schedule

Once these parameters are established, the limitations and parameters of the project need to be clarified and the aspects that are not to be included in the project identified. When doing this, the project scope will make clear to the stakeholders, senior management, and team members what will and will not be included in the final product or service.

Along with this, the scope of the project must have a tangible objective for the organization that is undertaking the project. This is integral for the scope of the project, since it will play a vital role in how project methodologies are applied to complete it.

Facets of Scope Management

Three processes form part of Project Scope Management - planning, controlling, and closing.

Planning: The planning process is when an attempt is made to capture and define the work that needs competition.

Controlling: The controlling and monitoring processes are concerned with documenting tracking, scope creep, tracking, and disapproving/ approving project changes.

Closing: The final process, closing, includes an audit of the project deliverables and an assessment of the outcomes against the original plan.

The Scope Statement

The scope of a project is the clear identification of the work that is required to successfully complete or deliver a project. One of the project manager's responsibilities is to ensure that only the required work (the scope) will be performed and that each of the deliverables can be completed in the allotted time and within budget.

The documentation of the scope of the project will explain the boundaries of the project, establish the responsibilities of each member of the team and set up procedures for how work that is completed will be verified and approved. This documentation may be referred to as the scope statement, or the statement of work, or the terms of reference.

Steps Involved in Project Scope Management

As a project manager, you'll need to define project scope no matter what methodology you choose to use.

A systematic process to capture, define, and monitor scope follows.

Step #1 - Define the needs

Defining the needs of the project is the first step toward the establishment of a project timeline, allocation of project resources and setting project goals. Only with these steps defined will you be able to understand the work that needs to be done – in other words, the scope of the project needs to be defined. Once that is done, team members can be allocated tasks, and provided direction to deliver a project in the given time and budget.

Step #2 - Understand the Project Objectives

To define the project scope, it is important to first establish the objectives of the project, which may include a new product, creating a new service within the organization, or developing a new piece of software. There are a number of objectives that could be central to a project and it becomes the role of the project manager to ensure that the team delivers that result according to the specified features or functions.

Notice:

Details of Project scope management

Scope comprises the totality of the outputs, outcomes and benefits and the work required to produce them. It is the scope of work that is the deciding factor as to whether it will be managed as a project, programme or portfolio.

The way in which scope is managed depends upon two things; the nature of the objectives (outputs, benefits or strategic) and the definability of the objectives.

The scope of a project will typically include outputs, but may be extended to cover benefits. The scope of a programme invariably covers benefits and the resulting change management. The scope of a portfolio is defined by the strategic objectives it is designed to achieve.

Scope management is made up of six main areas that work in unison to identify, define and control the scope:

- requirements management gathers and assesses stakeholder wants and needs. Requirements are 'solution-free', i.e. they describe stakeholders' wants and needs but do not determine exactly how they will be met;
- solutions development takes the stakeholders' requirements and investigates how they may be achieved to provide the best value;
- benefits management takes requirements that have been expressed in terms of benefits and manages them through to their eventual delivery. This runs in parallel with requirements management and solutions development and utilises change management;
- change management deals with the transformation of business- as-usual that is necessary to utilise outputs and realise benefits;
- change control is a mechanism for capturing and assessing potential changes to scope. It ensures that only beneficial changes are made;
- configuration management monitors and documents the development of products. It makes sure that approved changes are recorded and superseded versions archived. The information kept in a configuration management system will help assess the impact of potential changes.

The degree to which detailed requirements and solutions can be predicted at the beginning of the project, programme or portfolio will influence how scope is managed.

Where the objective is well understood and has a tangible output (e.g. in construction and engineering) it is usual to define the scope as accurately as possible at the beginning of the life cycle. This reduces the level of changes that may be required and hence keeps costs from escalating. It is also useful to define what is outside of scope to avoid misunderstandings. Clearly defining what is in and out of scope reduces risk and manages the expectations of all key stakeholders.

Where the objective is less tangible, or subject to significant change, e.g. business change or some IT systems, a more flexible approach to scope is needed. This requires a careful approach to avoid escalating costs.

An important factor in managing the scope of work is to maximise value for money. The discipline of value management brings together an important set of processes and techniques that operate throughout the six areas. It ensures that investment in a project, programme or portfolio is optimised for the potential return it can deliver.

Project

Once a solution has been identified which meets the stakeholder requirements, the scope of the work can be illustrated using a product breakdown structure (PBS) and a work breakdown structure (WBS).

Identifying both products and the work involved in building them is an iterative activity. Where uncertainty about the end products exists, provision must be made for revisiting the PBS and WBS during the project life cycle.

The PBS is a hierarchical structure where the main output of the project is placed at the top level. The next level down shows the components that make up the higher level. This process continues to the level of individual products. Each product will have defined acceptance criteria and quality control methods.

A WBS takes a similar approach but shows the work required to create the products. The lowest level of a WBS shows the activities that would be used to create a network diagram for time scheduling.

In well-defined projects the approved breakdown structures are baselined at the end of the definition phase of the project life cycle. The products in the PBS will become the configuration items for use in configuration management, and any proposed changes of scope will go through a formal change control procedure.

In flexible projects that use an Agile approach, the scope baseline will predominantly comprise functional requirements. The products that fulfill these functions will be developed iteratively throughout the life cycle.

Project Scope Management Processes

Project scope management includes 6 processes. The project scope management processes are:

- 1. Plan scope management
- 2. Collect requirements
- 3. Define scope
- 4. Create Work Breakdown Structure
- 5. Validate scope
- 6. Control scope.

Let's look at each of those.

Plan Scope Management Process

The point of doing this is to give you a scope management plan at the end of it. That sets out how you will define, manage, validate and control your project's scope. Putting the work in up front to define this gives you something to refer to later. You may find that you can use another project's scope management plan as a starting point, as scope management processes don't vary wildly between projects once your company has settled on a way of working that is successful for them.

The result of this process is the scope management plan. This is part of your project management plan and includes:

- How you will prepare a detailed scope statement
- How you will create your Work Breakdown Structure (WBS) from the scope statement
- How you are going to maintain and approve that WBS
- How you will get formal acceptance for the project's deliverables
- How you will manage changes to scope.

The document doesn't have to be incredibly detailed or very formal: it simply has to be fit for purpose.

Collect Requirements Process

In this process, you'll work out what your stakeholders want from the project. Once you have <u>outlined your big idea</u>, you need to document the requirements and manage your stakeholders' expectations. This is important because often what they ask for isn't realistic or achievable given other project constraints, like cost.

The output of your requirements collection work is a documented set of requirements. This should be as comprehensive as possible and will normally include several categories of requirements such as:

- Functional and non-functional requirements
- Stakeholder requirements such as reporting requirements
- Support and training requirements
- Business requirements
- Project requirements such as levels of service or quality

You'll also document the dependencies, assumptions, and constraints that specifically relate to requirements.

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CHAPTER 5

WORK BREAKDOWN STRUCTURES

Introduction

Dividing complex projects to simpler and manageable tasks is the process identified as Work Breakdown Structure (WBS).

Usually, the project managers use this method for simplifying the project execution. In WBS, much larger tasks are broken down to manageable chunks of work. These chunks can be easily supervised and estimated.

WBS is not restricted to a specific field when it comes to application. This methodology can be used for any type of project management.

Following are a few reasons for creating a WBS in a project:

- Accurate and readable project organization.
- Accurate assignment of responsibilities to the project team.
- Indicates the project milestones and control points.
- Helps to estimate the cost, time and risk.
- Illustrate the project scope, so the stakeholders can have a better understanding of the same.

Construction of a WBS

Identifying the main deliverables of a project is the starting point for deriving a work breakdown structure.

This important step is usually done by the project managers and the subject matter experts (SMEs) involved in the project. Once this step is completed, the subject matter experts start breaking down the high-level tasks into smaller chunks of work.

In the process of breaking down the tasks, one can break them down into different levels of detail. One can detail a high-level task into ten sub-tasks while another can detail the same high-level task into 20 sub-tasks.

Therefore, there is no hard and fast rule on how you should breakdown a task in WBS. Rather, the level of breakdown is a matter of the project type and the management style followed for the project.

In general, there are a few "rules" used for determining the smallest task chunk. In "two weeks" rule, nothing is broken down smaller than two weeks worth of work.

This means, the smallest task of the WBS is at least two-week long. 8/80 is another rule used when creating a WBS. This rule implies that no task should be smaller than 8 hours of work and should not be larger than 80 hours of work.

One can use many forms to display their WBS. Some use tree structure to illustrate the WBS, while others use lists and tables. Outlining is one of the easiest ways of representing a WBS.

Project Name
Task 1
Subtask 1.1
Work Package 1.1.1
Work Package 1.1.2
Subtask 1.2
Task 2
Task 2
Subtask 2.1
Workpackage 1.2.2
Task 2.1
Workpackage 2.1.1
Workpackage 2.1.2

Following example is an outlined WBS:

There are many design goals for WBS. Some important goals are as follows:

- Giving visibility to important work efforts.
- Giving visibility to risky work efforts.
- Illustrate the correlation between the activities and deliverables.
- Show clear ownership by task leaders.

WBS Diagram

In a WBS diagram, the project scope is graphically expressed. Usually the diagram starts with a graphic object or a box at the top, which represents the entire project. Then, there are sub-components under the box.

These boxes represent the deliverables of the project. Under each deliverable, there are subelements listed. These sub-elements are the activities that should be performed in order to achieve the deliverables.

Although most of the WBS diagrams are designed based on the deliveries, some WBS are created based on the project phases. Usually, information technology projects are perfectly fit into WBS model.

Therefore, almost all information technology projects make use of WBS.

In addition to the general use of WBS, there is specific objective for deriving a WBS as well. WBS is the input for Gantt charts, a tool that is used for project management purpose.

Gantt chart is used for tracking the progression of the tasks derived by WBS.

Following is a sample WBS diagram:



WBS Numbering

In a WBS, every level item has a unique assigned number so that work can be identified and tracked over time. A WBS may have varying numbers of decomposition levels, but there is a general scheme for how to number each level so that tasks are uniquely numbered and correctly summarized. Below is the general convention for how tasks are decomposed:

- Level 1 Designated by 1.0. This level is the top level of the WBS and is usually the project name. All other levels are subordinate to this level.
- Level 2 Designated by 1.X (e.g., 1.1, 1.2). This level is the summary level.
- Level 3 Designated by 1.X.X (e.g., 1.1.1, 1.1.2). This third level comprises the subcomponents to each level 2 summary element. This effort continues down until progressively subordinate levels are assigned for all work required for the entire project.

If tasks are properly subordinated, most project scheduling tools will automatically number tasks using the above convention.

WBS Construction Methods

Although there are different methods of decomposing project work and creating a WBS, the most straightforward and effective way is to use some form of visual display of the deliverables, phases, or activities. Ideally, all Project Team members will convene and brainstorm all work required to complete project deliverables successfully. Involvement of all team members in this process increases the

likelihood that the resulting WBS will be comprehensive. Typically, team members start by identifying all project deliverables or milestones and then decompose them one at a time into a detailed and sequential list of the detailed activities required to complete the deliverable or milestone. One way of visually conducting this process is by using post-it notes to represent each deliverable and sub-activity.

WBS Types

Deliverable-oriented WBS Process-centered WBS

Deliverable-Oriented WBS

A deliverable-oriented WBS is built around the project's desired outcomes or deliverables. This type of WBS would likely include the following characteristics:

- Level 2 items are the names of all vendor project deliverables that are expected to be required as part of a contract. Level 2 should also include any agency deliverables tasks.
- Level 3 items are key activities required to produce the Level 2 deliverables.
- Additional levels are used depending upon the magnitude of the deliverables and the level of detail required to reliably estimate cost and schedule.
- In the deliverable-oriented WBS, all deliverables are identified, and all work is included.

Statewide projects procured as Firm-Fixed-Price contracts are well suited to the deliverableoriented approach. Organized this way, project managers and agency management can review interim progress against deliverables and easily determine the percentage of the work that is complete. Sometimes, a deliverable-oriented WBS and its associated schedule can be confusing to read because their items are not organized sequentially at the highest level. They are, however, very useful in demonstrating progress against contracted deliverables.

Process-Centered WBS

A process-centered WBS is similar to a deliverable-oriented WBS except that it is organized, at the highest level, by phases or steps in a process rather than by deliverables. The benefit of using a process-centered WBS is that it encourages the inclusion of process-required deliverables, such as System Development Life Cycle (SDLC) deliverables. Regardless of the type of WBS employed, project teams should ensure that all contractual and SDLC deliverables are accounted for in the WBS. A process-centered WBS typically includes the following:

- Level 2 activities are phases or schedule checkpoints/milestones. These activities could be SDLC phases such as Initiation, Planning, etc.
- Level 3 activities are those activities required to complete Level 2 phases or milestones. Multiple tasks are included for any work that needs to be done in multiple phases.
- Additional levels are used depending on the duration of the phase or schedule and the level of detail required to reliably estimate cost and schedule.

In the process-centered WBS, all deliverables are identified, and all work is included. This comprehensiveness will reduce the risk of "off balance sheet" work tasks, which might have unexpected impacts on the project schedule.

WBS Levels

Two industry-standard methods exist for determining how many levels a WBS should have:

- Traditionally, the *Project Management Body of Knowledge* advocates a predetermined sevenlevel model, which has the advantage of clear labels and definitions of each level (e.g., program, project, task, subtask, work product, and level of effort); the disadvantage to this model is that it requires a level of detail that may be unnecessary. Models/methods with predetermined levels and level definitions make clear what information needs to be included and where, but they lack flexibility.
- The more contemporary approach is to let the project characteristics dictate the number of levels used in the judgment of the Project Manager. It is a good practice to identify the number of levels to be used so that a project maintains consistency when building the WBS. The number of levels must be sufficient to allow the Project Manager to reliably estimate schedule and cost and effectively monitor and control work packages.

How Much Detail?

The WBS should be sufficiently detailed to allow the Project Manager to reliably estimate schedule and cost. One point of view is that the lowest level of project detail should be no more than 40 total hours of work and should be assignable to only one person. This level of detail allows the Project Manager to easily assess what project work is complete, who is responsible for executing what work, and what tasks are at variance with the baseline plan.

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CHAPTER 8

INFORMATION SYSTEMS PROJECT ORGANIZATIONAL STRUCTURES

Introduction to organizational structures

A **project organization** is a **structure** that facilitates the coordination and implementation of **project** activities. Its main reason is to create an environment that fosters interactions among the team members with a minimum amount of disruptions, overlaps and conflict.

What is organizational structure?

By structure, we mean the framework around which the group is organized, the underpinnings which keep the coalition functioning. It's the operating manual that tells members how the organization is put together and how it works. More specifically, structure describes how members are accepted, how leadership is chosen, and how decisions are made.

Why should you develop a structure for your organization?

- **Structure gives members clear guidelines for how to proceed.** A clearly-established structure gives the group a means to maintain order and resolve disagreements.
- **Structure binds members together.** It gives meaning and identity to the people who join the group, as well as to the group itself.

• Structure in any organization is inevitable -- an organization, by definition, implies a structure. Your group is going to have some structure whether it chooses to or not. It might as well be the structure which best matches up with what kind of organization you have, what kind of people are in it, and what you see yourself doing.

When should you develop a structure for your organization?

It is important to deal with structure early in the organization's development. Structural development can occur *in proportion* to other work the organization is doing, so that it does not crowd out that work. And it can occur *in parallel* with, at the same time as, your organization's growing accomplishments, so they take place in tandem, side by side. This means that you should think about structure from the beginning of your organization's life. As your group grows and changes, so should your thinking on the group's structure.

Elements of Structure

While the need for structure is clear, the best structure for a particular coalition is harder to determine. The best structure for any organization will depend upon who its members are, what the setting is, and how far the organization has come in its development.

Regardless of what type of structure your organization decides upon, three elements will always be there. They are inherent in the very idea of an organizational structure.

They are:

- Some kind of governance
- Rules by which the organization operates
- A distribution of work

Governance

The first element of structure is governance - some person or group has to make the decisions within the organization.

Rules by which the organization operates

Another important part of structure is having rules by which the organization operates. Many of these rules may be explicitly stated, while others may be implicit and unstated, though not necessarily any less powerful.

Distribution of work

Inherent in any organizational structure also is a distribution of work. The distribution can be formal or informal, temporary or enduring, but every organization will have some type of division of labor.

There are four tasks that are key to any group:

- *Envisioning desired changes*. The group needs someone who looks at the world in a slightly different way and believes he or she can make others look at things from the same point of view.
- *Transforming the community*. The group needs people who will go out and do the work that has been envisioned.
- *Planning for integration*. Someone needs to take the vision and figure out how to accomplish it by breaking it up into strategies and goals.
- Supporting the efforts of those working to promote change. The group needs support from the community to raise money for the organization, champion the initiative in the state legislature, and ensure that they continue working towards their vision.

Common Roles

Every group is different, and so each will have slightly different terms for the roles individuals play in their organization, but below are some common terms, along with definitions and their typical functions.

- An initial *steering committee* is the group of people who get things started. Often, this group will create plans for funding, and organizational and board development. It may also generate by-laws, and then dissolve. If they continue to meet after approximately the first six months, we might say they have metamorphosed into a *coordinating council*.
- A coordinating council (also referred to as a coordinating committee, executive committee, and executive council), modifies broad, organization-wide objectives and strategies in response to input from individuals or committees.
- Often, one person will take the place of the coordinating council, or may serve as its head. Such a person may be known as the *Executive Director*, *Project Coordinator*, *Program Director*, or *President*. He or she sometimes has a paid position, and may coordinate, manage, inspire, supervise, and support the work of other members of the organization.
- *Task forces* are made up of members who work together around broad objectives. Task forces integrate the ideas set forward with the community work being done.

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CHAPTER 10

INFORMATION SYSTEMS PROJECT RISK MANAGEMENT

Key Terms, Descriptions, and Principles

Definition of Risk

Risk is a measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule and performance constraints. Risk can be associated with all aspects of a program (e.g., threat, technology maturity, supplier capability, design maturation, performance against plan,) as these aspects relate across the Work Breakdown Structure (WBS) and Integrated Master Schedule (IMS). Risk addresses the potential variation in the planned approach and its expected outcome. While such variation could include positive as well as negative effects, this guide will only address negative future effects since programs have typically experienced difficulty in this area during the acquisition process.

Components of Risk

Risks have three components:

- A future root cause (yet to happen), which, if eliminated or corrected, would prevent a potential consequence from occurring,
- A probability (or likelihood) assessed at the present time of that future root cause occurring, and
- The consequence (or effect) of that future occurrence.

A future root cause is the most basic reason for the presence of a risk. Accordingly, risks should be tied to future root causes and their effects.

Risk versus Issue Management

Risk management is the overarching process that encompasses identification, analysis, mitigation planning, mitigation plan implementation, and tracking. Risk management should begin at the earliest stages of program planning and continue throughout the total life-cycle of the program. Additionally, risk management is most effective if it is fully integrated with the program's systems engineering and program management processes—as a driver and a dependency on

those processes for root cause and consequence management. A common misconception, and program office practice, concerning risk management is to identify and track issues (vice risks), and then manage the consequences (vice the root causes). This practice tends to mask true risks, and it serves to track rather than resolve or mitigate risks. This guide focuses on risk mitigation planning and implementation rather on risk avoidance, transfer or assumption.

Note: Risks should not be confused with issues. If a root cause is described in the past tense, the root cause has already occurred, and hence, it is an issue that needs to be resolved, but it is not a risk. While issue management is one of the main functions of PMs, an *important difference between issue management and risk management is that issue management applies resources to address and resolve current issues or problems, while risk management applies resources to mitigate future potential root causes and their consequences.*

To illustrate the difference between a risk and an issue, consider, for example, a commercial-offthe-shelf (COTS) sourcing decision process. Questions such as the following should be asked and answered prior to the COTS decision:

- "Is there any assurance the sole source provider of critical COTS components will not discontinue the product during government acquisition and usage?"
- "Does the government have a back-up source?"
- "Can the government acquire data to facilitate production of the critical components?"

These statements lead to the identification of root causes and possible mitigation plans. If a COTS acquisition is decided, and sometime later the manufacturer of a COTS circuit card has informed the XYZ radar builder that the circuit card will be discontinued and no longer available within 10 months, then an *issue* has emerged and with upfront planning the issue might have been prevented. A *risk* is the **likelihood and consequence of future** production schedule delays in radar deliveries if a replacement card cannot be found or developed and made available within 10 months.

If a program is behind schedule on release of engineering drawings to the fabricator, this is not a risk; it is an issue that has already emerged and needs to be resolved. Other examples of issues include failure of components under test or analyses that show a design shortfall. These are program problems that should be handled as issues instead of risks, since their probability of occurrence is 1.0 (certain to occur or has occurred). It should also be noted that issues may have adverse future consequences to the program (as a risk would have).

Risk Management Objective

PMs have a wide range of supporting data and processes to help them integrate and balance programmatic constraints against risk. The Acquisition Program Baseline (APB) for each program defines the top-level cost, schedule, and technical performance parameters for that program. Additionally, acquisition planning documents such as Life-Cycle Cost Estimates (LCCE), Systems Engineering Plans (SEP), IMS, Integrated Master Plans (IMP), Test and Evaluation Master Plans (TEMP) and Technology Readiness Assessment (TRA) provide detailed

cost, schedule, and technical performance measures for program management efforts. Since effective risk management requires a stable and recognized baseline from which to access, mitigate, and manage program risk it is critical that the program use an IMP/IMS. Processes managed by the contractor, such as the IMP, contractor IMS, and Earned Value Management (EVM), provide the PM with additional insight into balancing program requirements and constraints against cost, schedule, or technical risk. The objective of a well-managed risk management program is to provide a repeatable process for balancing cost, schedule, and performance goals within program funding, especially on programs with designs that approach or exceed the state-of-the-art or have tightly constrained or optimistic cost, schedule, and performance goals. Without effective risk management the program office may find itself doing crisis management, a resource-intensive process that is typically constrained by a restricted set of available options. Successful risk management depends on the knowledge gleaned from assessments of all aspects of the program coupled with appropriate mitigations applied to the specific root causes and consequences.

A key concept here is that the government shares the risk with the development, production, or support contractor (if commercial support is chosen), and does not transfer all risks to the contractor. The program office always has a responsibility to the system user to develop a capable and supportable system and can not absolve itself of that responsibility. Therefore, all program risks, whether primarily managed by the program office or by the development/support contractor, are of concern and must be assessed and managed by the program office. Once the program office has determined which risks and how much of each risk to share with the contractor, it must then assess the total risk assumed by the developing contractor (including subcontractors). The program office and the developer must work from a common risk management process and database. Successful mitigation requires that government and the contractor communicate all program risks for mutual adjudication. Both parties may not always agree on risk likelihoods, and the government PM maintains ultimate approval authority for risk definition and assignment. A common risk database available and open to the government and the contractor is an extremely valuable tool. Risk mitigation involves selection of the option that best provides the balance between performance and cost. Recall that schedule slips generally and directly impact cost. It is also possible that throughout the system life cycle there may be a need for different near-term and long-term mitigation approaches.

An effective risk management process requires a commitment on the part of the PM, the program office and the contractor to be successful. Many impediments exist to risk management implementation, however, the program team must work together to overcome these obstacles. One good example is the natural reluctance to identify real program risks early for fear of jeopardizing support of the program by decision makers. Another example is the lack of sufficient funds to properly implement the risk mitigation process. However, when properly resourced and implemented, the risk management process supports setting and achieving realistic cost, schedule, and performance objectives and provides early identification of risks for special attention and mitigation.

The Risk Management Process

Risk management is a continuous process that is accomplished throughout the life cycle of a system. It is an organized methodology for continuously identifying and measuring the unknowns; developing mitigation options; selecting, planning, and implementing appropriate risk mitigations; and tracking the implementation to ensure successful risk reduction. Effective risk management depends on risk management planning; early identification and analyses of risks; early implementation of corrective actions; continuous monitoring and reassessment; and communication, documentation, and coordination.

Acquisition program risk management is not a stand-alone program office task. It is supported by a number of other program office tasks. In turn, the results of risk management are used to finalize those tasks. Important tasks, which must be integrated as part of the risk management process, include requirements development, logical solution and design solution (systems engineering), schedule development, performance measurement, EVM (when implemented), and cost estimating. Planning a good risk management program integral to the overall program management process ensures risks are handled at the appropriate management level.

Emphasis on risk management coincides with overall DoD efforts to reduce life-cycle costs (LCC) of system acquisitions. New processes, reforms, and initiatives are being implemented with risk management as a key component. It is essential that programs define, implement and document an appropriate risk management and mitigation approach. Risk management should be designed to enhance program management effectiveness and provide PMs with a key tool to reduce LCC, increase program likelihood of success, and assess areas of cost uncertainty.

The Risk Management Process Model

The risk management process model (see figure 1) includes the following key activities, performed on a continuous basis:

- Risk Identification,
- Risk Analysis,
- Risk Mitigation Planning,
- Risk Mitigation Plan Implementation, and
- Risk Tracking.



Figure 1. DoD Risk Management Process

Acquisition programs run the gamut from simple to complex procurements and support of mature technologies that are relatively inexpensive to state-of-the-art and beyond programs valued in the multibillions of dollars. Effective risk management approaches generally have consistent characteristics and follow common guidelines regardless of program size. Some characteristics of effective risk management approach are discussed below.

Characteristics of Successful Risk Management Approaches

Successful acquisition programs will likely have the following risk management characteristics:

- Feasible, stable, and well-understood user requirements, supported by leadership / stakeholders, and integrated with program decisions;
- A close partnership with users, industry, and other stakeholders;
- A planned risk management process integral to the acquisition process, especially to the technical planning (SEP and TEMP) processes, and other program related partnerships;
- Continuous, event-driven technical reviews to help define a program that satisfies the user's needs within acceptable risk;
- Identified risks and completed risk analyses;
- Developed, resourced, and implemented risk mitigation plans;
- Acquisition and support strategies consistent with risk level and risk mitigation plans;
- Established thresholds and criteria for proactively implementing defined risk mitigation plans;
- Continuous and iterative assessment of risks;
- The risk analysis function independent from the PM;
- A defined set of success criteria for performance, schedule, and cost elements; and
- A formally documented risk management process.

To support these efforts, assessments via technical reviews should be performed as early as possible in the life cycle (as soon as performance requirements are developed) to ensure critical performance, schedule,

and life-cycle cost risks are addressed, with mitigation actions incorporated into program planning and budget projections. As the award of a contract requiring EVM approaches, preparation and planning should commence for the execution of the Integrated Baseline Review (IBR) process in accordance with the Defense Acquisition Guidebook. Chapter 8 addresses risk planning and Risk Management Plans (RMPs).

Top-Level Guidelines for Effective Risk Management

THIS IS A SAMPLE

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