Planning of Human Resources and Communication

In current lecture 2 topics are handled: planning of human resources and communication.

I Project Human Resource Planning

Project human resource planning (HRP) is in other words establishing project organization having following objectives to ensure that:

- necessary people are for specific work time available
- each work package has an unambiguous owner
- each team member has clear understanding of his/her role and responsibility

Inputs and corresponding outputs from HRP by PMBOK are illustrated on the next figure:

![Figure 1. HRP Inputs and Outputs](image)

HRP inputs are:

- activity resource requirements
  - preliminary requirements regarding the required people and competencies for the project team members
- enterprise environmental factors
  - organizational culture and structure
  - existing human resources
  - personnel administration policies
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- marketplace conditions
- organizational process assets
  - organizational standard processes and policies and standardized role descriptions
  - templates for organizational charts and position descriptions
  - historical information on organizational structures that have worked in previous projects

**Corresponding outputs are:**

- roles and responsibilities
  - expressed in organization charts and positions description
  - hierarchical, matrix, and text-oriented format
- staffing management plan
  - when and how human resource requirements will be met
  - expressed in tables, resources histograms etc

**HRP consists of following steps:**

1. defining roles
2. defining reporting relationships and responsibilities
3. establishing staffing management plan

**1. Defining Roles**

With roles are defined responsibilities, inputs and outputs to implement them

**Role** – set of responsibilities, authorities and competencies

**Responsibilities** – work what is expected from team member to get a result

**Authority** - right to apply project resources, make decisions and sign approvals; right to choose work method, accept quality and respond to project disagreements

**Competency** – skills and capabilities, what are needed to complete tasks

**Roles in Different Methodologies**

RUP roles - analysts, developers, testers, managers, others;

OpenUP roles - analysts, whatever role, architect, developer, project manager, stakeholder, tester;

Scrum roles – product owner, scrum master, scrum team;

XP roles - client, tester, programmer, tracker, coach
Here is one table illustrating roles in agile approaches:

**Table 1. Roles in Agile Approaches**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Generic Agile</th>
<th>XP</th>
<th>Scrum</th>
<th>DSDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teams</td>
<td>1 – 6</td>
<td>1 team per project</td>
<td>1 – 4 or more</td>
<td>1 – 6</td>
</tr>
<tr>
<td>Team size</td>
<td>2 – 10</td>
<td>3 – 16</td>
<td>5 – 9</td>
<td>2 – 6</td>
</tr>
<tr>
<td>Team Roles</td>
<td>Product Owner, Agile Project Manager, Technical Lead, Developer, Tester, UX Designer</td>
<td>Customer, Programmer, Tester, Tracker, Coach</td>
<td>Scrum master, Scrum Team (Experienced Engineer, Junior Engineer, [QA Tester], [Writer])</td>
<td>Team Leader, Ambassador User, [Advisor User], Senior Developer, Developer, Scribe</td>
</tr>
<tr>
<td>Non-Team Roles</td>
<td>Business Sponsor, Agile Programme Manager, Architect, Agile Coach</td>
<td>Big Boss</td>
<td>Scrum master, Product Owner</td>
<td>Visionary, Executive Sponsor, Project Manager, Technical Co-ordinator, Facilitator</td>
</tr>
</tbody>
</table>

**Project Manager Role in Different Methodologies**

**In RUP:**
- acquires resources
- sets priorities
- coordinates collaboration with project customer and system end users
- tries to keep project team on the right course
- creates procedures for project outcomes

These responsibilities are illustrated on the next figure:
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Figure 2. Responsibilities and Activities of Project Manager in RUP

In OpenUP

- guides team to get successful result and customer to accept product
- estimates project risks and controls them trough mitigation strategies

Pictorially expressed on the next figure:

Figure 3. Project Manager Roles in OpenUP

2. Defining of Report Relationships and Responsibilities

Defining of report relationships and responsibilities is in other words putting in place project control and information flow structure expressed in organization chart. These charts can be:
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- **hierarchical-type charts** – show positions and relationships in a graphic, top-down method
- **matrix-based charts** – illustrate the connections between work that needs to be done and project team members
  - RAM (Responsibility Assignment Matrix)
  - RACI (Responsible, Approve/Accountable, Consult, Inform)
- **text-oriented formats** – detailed description of team member responsibilities, authority, competencies and qualifications

One example of hierarchical-type chart showing project organizational structure:

![Hierarchical-type chart showing project organizational structure](image)

**Figure 4. Example of Project Organization Structure**

One example of responsibility assignment matrix:

**Table 2. Example of Responsibility Assignment Matrix**

<table>
<thead>
<tr>
<th>WBS activities</th>
<th>1.1.1</th>
<th>1.1.2</th>
<th>1.1.3</th>
<th>1.1.4</th>
<th>1.1.5</th>
<th>1.1.6</th>
<th>1.1.7</th>
<th>1.1.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems Engineering</td>
<td>R</td>
<td>R</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software Development</td>
<td>R</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality Assurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated Logistics Support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*R = Responsible organizational unit
P = Performing organizational unit

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One example of RACI matrix:

**Table 3. Example of RACI Matrix**

<table>
<thead>
<tr>
<th></th>
<th>Project Mgr</th>
<th>Bus. Lead</th>
<th>Tech Lead</th>
<th>Funct. Mgr</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Project Plan</td>
<td>R</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>I</td>
</tr>
<tr>
<td>Acquire resources</td>
<td>R</td>
<td></td>
<td></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Develop requirements</td>
<td>C</td>
<td>R</td>
<td>R</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>Construction</td>
<td>C/I</td>
<td>C</td>
<td>R</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Quality Control</td>
<td>C/I</td>
<td>R</td>
<td>C</td>
<td>C</td>
<td>I</td>
</tr>
<tr>
<td>Close Project</td>
<td>R</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>A</td>
</tr>
</tbody>
</table>

**Description of assignment roles:**

- **Responsible**
  - Individual/s who perform a task/activity; the doer, responsible for action/implementation
  - The degree of responsibility is defined by the Accountable person
  - Responsibility can be shared
  - While Accountability can NOT be delegated, Responsibility can be delegated

- **Accountable**
  - The individual who has ultimate accountability and authority
  - There is only one accountable (A) to each task/activity
  - Accountability is assigned at the lowest level and implied at higher levels
  - Accountability cannot be delegated

- **Consulted**
  - The individuals to be consulted prior to a final decision or action is taken
  - Two-way communication

- **Informed**
  - The individuals that need to be informed after a decision or action is taken

**RACI benefits**

- encourages teamwork by clarifying roles and responsibilities
- eliminates duplication of effort
- reduces misunderstanding
- improves communication - make sure people are not ‘left out’
- determines ownership
- helps clarify activities and tasks in a process
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- reduces bad decisions by ensuring the correct people are involved
- clarifies hand-offs and boundaries
- improves cross-functional view for all employees

Considerations about RACI

- **Accountable**
  - too many A’s? - Probably a sign of confusion - no one will be sure who really had the task and each individual will probably have a different approach and/or expectation(s).
  - multiple “A”ccountable and unrelated resources can cause conflicts in differences of opinion
  - you should be sure the team members are co-chairs, co-leads, or at least in similar roles and will collaborate well together.
  - many A’s - Is this person a bottleneck? Can these tasks be shared or segregated?
  - multiple A’s should be kept to a minimum or each vertical column should have only ONE Accountable

- **Responsible**
  - multiple “R”esponsible can cause unnecessary or duplicate work.
  - make one team member responsible for each task.
  - lot’s of R’s - The individual may have too much to do - can the activities be broken into small sections and split out to others?
  - each vertical column should have one Responsible, but can have more in some situations of shared responsibility.
  - with no R’s a gap occurs - Is the task being completed? Assign Responsibility.

- **Consult**
  - Form one side multiple “C”onsulted is desirable to collect input from all potential subject matter experts.
  - From ohter side - minimize the number of Consults - Make sure the consult is necessary and not just a ‘feel good’ contact.

- **Inform**
  - Keeping multiple people “I”nformed helps develop capacity.
  - If a team member is absent or unable to carry out work for any reason, you have developed a successor for that role.
  - Too many I’s? Maybe some people only need to be informed if exceptional circumstances occur - Build the appropriate criteria into the process

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In general:
- any team member should have only one role;
- if any column is empty, consider if that resource is necessary for the project;
- no empty spaces in a row - Does this person need to be involved in every step? Try to reduce C’s and I’s First’;
- completely empty row - Why was this function included? Are we missing including them when they should be? Can the function be correctly eliminated from the process?

3. Defining Project Staffing Management Plan

Project staffing management plan describes when and how human resource requirements will be met and includes following consisting of following items:

- **staff acquisition** - how and through what methods the people needed for the project will be acquired, which may include both personnel internal to the performing organization and external to it, such as consultants

- **resource calendars, timetables, and histograms** - information on when resources will be needed and in what durations, shown through calendars, timetables, and histograms

- **training** - formal plan for project team member training, though informal training will also occur

- **compliance and safety** - any measures that will be taken to ensure that any safety, governmental, regulatory, organizational, or contractual obligations are followed that are applicable to human resource requirements

- **team performance assessments** - include any team performance goals, and how the overall performance of the project team will be measured and evaluated

- **project performance appraisals** - include the procedures, methods, and guidelines for the performance appraisal of individual project team members

- **recognition and rewards** - details the approaches that will be taken for promoting and reinforcing desired behavior, including the costs associated with any recognition or reward program

- **staff release criteria** - describes how team members will be released from the project; how payment for work completed will be handled for the departing team member

One example of staffing plan is shown in the next table:
Table 4. Example of Staffing Plan

<table>
<thead>
<tr>
<th>Role</th>
<th>Skills &amp; Knowledge</th>
<th>From MM/YY</th>
<th>To MM/YY</th>
<th>% Req.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>Experienced PM 5 yrs+</td>
<td>01/05</td>
<td>05/05</td>
<td>100%</td>
<td>IT Background preferred</td>
</tr>
<tr>
<td>Business Consultant</td>
<td>Requirements, modeling, logistics.</td>
<td>01/05</td>
<td>05/05</td>
<td>Declines 100% to 25%</td>
<td>Internal Resource preferred (no contract resource)</td>
</tr>
<tr>
<td>Developer</td>
<td>Java, Oracle</td>
<td>01/05</td>
<td>05/05</td>
<td>50% to 100%</td>
<td></td>
</tr>
<tr>
<td>Tester</td>
<td>Test Management Tools</td>
<td>04/05</td>
<td>05/05</td>
<td>100% to 50%</td>
<td></td>
</tr>
<tr>
<td>Production Support</td>
<td>Java, Oracle, Production Environment</td>
<td>04/05</td>
<td>05/05</td>
<td>100% to 25%</td>
<td></td>
</tr>
</tbody>
</table>

One example of resource histogram is presented on the next figure:

![Figure 5. Example of Resource Histogram](image)

**Limitations in Supplying with Personnel**

- project member location in main organization
- team members preferences for composition, role allocation and fulfillment
- dependence of personal skills and capabilities
- availability of resources
- team communication model conditioned by development methodology

Being project team member depends on:

- rules, on what projects in main organization are organized

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management structure in customer and performer organization
project members subordination relationships in main organization

Management Structure in Organization

Organization management structure is an enterprise environmental factor which can affect the availability of resources and influence how projects are conducted.

Organizations business can be managed:
- **without projects** - management of everyday life (business) in organization is done with no projects (performing only functions);
- **with projects** - project management services are offered outside the company (IT companies for example) or project services are offered inside the company (IT department for example)

The result of bounding together main organization (customer side) with project organization (customer + project manager + implementer) we can get functional, projectized, matrix or composed organization.

Functional organization

- each employee has one clear superior
- is based on departmental, specialty, or business lines, such as accounting, marketing, sales, customer service, information systems, and so on
- the scope of the project is usually limited to the boundaries of the function
- consultations are held by heads of different departments

Pictorially:

![Functional Organization Diagram](image)

(Black boxes represent staff engaged in project activities.)

Figure 6. Functional Organization
**Projectized organization**

- team members are often co-located
- most of the organization’s resources are involved in project work
- project managers have a great deal of independence and authority
- projectized organizations often have organizational units called departments, but these groups either report directly to the project manager or provide support services to the various projects

Pictorially:

![Projectized Organization Diagram](image)

(Black boxes represent staff engaged in project activities.)

**Figure 7. Projectized Organization**

**Matrix organization**

- a blend of functional and projectized characteristics
- **Weak** matrices maintain many of the characteristics of a functional organization, and the project manager role is more of a coordinator than that of a true project manager
- **Strong** matrices have many of the characteristics of the projectized organization, and can have full-time project managers with considerable authority and full-time project administrative staff
- **Balanced** matrix organization recognizes the need for a project manager, it does not provide the project manager with the full authority over the project and project funding

Weak matrix organization pictorially:
Figure 8. Weak Matrix Organization
Strong matrix organization pictorially:

Figure 9. Strong Matrix Organization

Balanced matrix organization pictorially:
Composed organization involves all previously described structures at various levels, pictorially:

Figure 11. Composed Organization

**Determination of Project Manager**

Project Manager is determined pending on his/her position in organization:

- by resource manager – superior of project manager;
- by project sponsor – project initiator;
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- by project manager him-/herself;

Following table shows key project-related characteristics of the major types of organizational structures:

**Table 5. Organizational Structure Influences on Projects**

<table>
<thead>
<tr>
<th>Project Characteristics</th>
<th>Functional</th>
<th>Matrix</th>
<th>Projectized</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Weak Matrix</td>
<td>Balanced Matrix</td>
</tr>
<tr>
<td>Project Manager’s Authority</td>
<td>Little or None</td>
<td>Limited</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>Percent of Performing Organization’s Personnel Assigned Full Time to Project Work</td>
<td>Virtually None</td>
<td>0 – 25%</td>
<td>15 – 60%</td>
</tr>
<tr>
<td>Project Manager’s Role</td>
<td>Part-time</td>
<td>Part-time</td>
<td>Full-time</td>
</tr>
<tr>
<td>Common Titles for Project Manager’s Role</td>
<td>Project Coordinator/ Project Leader</td>
<td>Project Coordinator/ Project Leader</td>
<td>Project Manager/ Project Officer</td>
</tr>
<tr>
<td>Project Management Administrative Staff</td>
<td>Part-time</td>
<td>Part-time</td>
<td>Part-time</td>
</tr>
</tbody>
</table>

II Project Communication Planning

Communication in its nature is expressing thoughts, emotions, opinions and ideas and carrying these over to other people. The goal of project communication is to effectively transfer the right amount of information, to the right people, in the right format, and at the right time.

Team communication is important for the following reasons:

- project-related information needs to be shared
- each member of the team needs to be with the team goal and his/her role in the team
- each team member has specific skills and knowledge that must be utilized and imparted to other members in the course of the work
- any questions or issues about the project must be broached and shared in order to resolve them
- any decisions taken must be imparted to all the members

Effective and open communication lines create feelings of trust and of belonging to the team. The more the members feel valued the more dedicated they are likely to be, and this in turn makes it easier for the team as a whole to achieve its goals.
Results of poor communication between team members

- the members may not understand what is needed and may waste time and energy in doing what is not required
- the members may misunderstand one another and develop personal - this can affect their desire to work together and thereby the quality of the work.
- the members may not be clear of the sequence of the things to be done and this can either hold up the project or play havoc with the deadlines.
- the members may not know what to change or how to change to make themselves more efficient

Presumptions of Effective Communication

- Information sender’s ability to make itself possibly clear to the receiver
- Constant feedback to understand each other on needed extent

Pictorially expressing:

![Diagram of communication process](image)

Figure 12. Example of Communication Nature

Communication Planning by PMBOK

Communication planning (CP) goals are as follows:

- Respond to the information and communications needs of the stakeholders
- Raise effectivity and quality of teamwork
- Share mutual competency in solving problems

CP steps are as follows:

- Determination of information and communication needs of various stakeholders
  - who, what kind, and how much information in what format needs
  - when it is needed
Developing communication management plan
Accordingly to communication management plan establishing communication approach (model) and tools to execute it

CP inputs and outputs are expressed on the next figure:

![Diagram](image)

**Figure 13. Project Communication Planning Inputs and Outputs**
The output from CP is communication management plan that determines following aspects:

- stakeholder communication requirements;
- information to be communicated, including language, format, content, and level of detail;
- reason for the distribution of that information;
- time frame and frequency for the distribution of required information;
- person responsible for
  - communicating the information;
  - authorizing release of confidential information;
- person or groups who will receive the information;
- methods or technologies used to convey the information
  - memos, e-mail, and/or press releases;
- resources allocated for communication activities, including time and budget;
- escalation process identifying time frames and the management chain (names) for escalation of issues that cannot be resolved at a lower staff level;
- method for updating and refining the communications management plan as the project progresses and develops;
- glossary of common terminology;
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- flow charts of the information flow in the project, workflows with possible sequence of authorization, list of reports, and meeting plans, etc.;
- communication constraints, usually derived from specific legislation or regulation, technology, and organizational policies, etc.

Examples of communication management plan:

**Table 6. Example of Communication Plan I**

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Information Needed</th>
<th>Frequency</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponsor</td>
<td>High-level cost, schedule, quality, performance, major problems and planned solutions</td>
<td>Monthly</td>
<td>Meeting and brief summary report</td>
</tr>
<tr>
<td>Customer/Marketing</td>
<td>High-level cost, schedule, quality, performance, major problems and planned solutions</td>
<td>Monthly</td>
<td>Meeting and brief summary report</td>
</tr>
<tr>
<td>Functional Managers</td>
<td>Major problems and planned solutions, personnel performance</td>
<td>Bi-weekly</td>
<td>E-mail</td>
</tr>
<tr>
<td>Finance</td>
<td>Project cost reports</td>
<td>Monthly</td>
<td>E-mail</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Weekly status reports from team leaders</td>
<td>Weekly</td>
<td>E-mail and weekly status meetings</td>
</tr>
</tbody>
</table>

**Table 7. Example of Communication Plan II**

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Purpose</th>
<th>Method</th>
<th>Audience</th>
<th>Frequency</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status report</td>
<td>Communicate project progress</td>
<td>-Verbal</td>
<td>-John Smith -Rest of stakeholders</td>
<td>Weekly</td>
<td>Project Manager</td>
</tr>
<tr>
<td>Meeting minutes</td>
<td>Communicate meeting minutes</td>
<td>Written</td>
<td>Stakeholders and group directors</td>
<td>After every meeting</td>
<td>Project Manager</td>
</tr>
<tr>
<td>Project management plan</td>
<td>Communicate project plan</td>
<td>Written</td>
<td>Stakeholders and group directors</td>
<td>After every update</td>
<td>Project Manager</td>
</tr>
<tr>
<td>Feedback</td>
<td>Communicate needs, issues, comments</td>
<td>-Verbal</td>
<td>-John Smith -Rest of stakeholders</td>
<td>As needed</td>
<td>Stakeholders</td>
</tr>
</tbody>
</table>

**Communication in Project**

Communication in project is bidirectional:
- **horizontal**, that means inside the team or between teams. This kind of communication is concerned with main work, in given context system development.
- **vertical**, that means between steering committee (system owner or customer) and project manager and between project manager and project team. This kind of communication handles management of system development, more specifically resource usage and issues concerning expected deliverables and their development.

The task of project manager is to coordinate bidirectional information exchange “traffic” to confirm that all stakeholders’ information needs are fulfilled. Pictorially:

![Figure 14. General Information Flows in Project](image)

Development information and communication regards system development functions:
- system specification
- system design
- implementation
- test
- user documentation and training
- maintenance
- configuration management

This kind of information is presented in models, textual descriptions and other like development documents.
Management information by PMBOK is expressed in following table showing different kind of project (management) documentation:

**Table 8. Project Management Documents in PMBOK**

<table>
<thead>
<tr>
<th>Process</th>
<th>Dokument</th>
<th>Alamdokument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiating</td>
<td>Project charter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stakeholder register</td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td>Scope management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Schedule management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Process Improvement plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human resource management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communications management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Risk management plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Procurement management plan</td>
<td></td>
</tr>
<tr>
<td>Executing</td>
<td>Lessons learned</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project staff assignments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resource calendars</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ground rules</td>
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<td>Monitoring &amp; Controlling</td>
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<td>Work performance measurements</td>
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<th>Closing</th>
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<td>Contract closures</td>
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</table>

**Communication Planning Tools and Techniques**

By PMBOK corresponding tools and techniques are as follows:

- communication requirement analysis
- communication models
- communication methods
- communication technology

**Communications Requirement Analysis**

Communications requirement analysis is based on:

- project organization structure and responsibility assignment matrix
- information needs of stakeholders associated with project
- number of communication channels

For number of communication channels following formula: \( N \times (N-1)/2 \), where \( N = \) number of people

Communications complexity rises with increase of channels and therefor rises probability of misunderstanding between project members

Information typically used to determine project communication requirements includes:

- organization charts,
- project organization and stakeholder responsibility relationships,
- disciplines, departments, and specialties involved in the project,
- logistics of how many persons will be involved with the project and at which locations,
- internal information needs (e.g., communicating across organizations),
- external information needs (e.g., communicating with the media, public, or contractors)
- stakeholder information from the stakeholder register and the stakeholder management strategy

**Team Communication Models**

Project manager can use 3 communication models:

- functional communication model
- unstructured communication model
- product team communication model

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**Functional communication model**

Each of the program functions is assigned to a single team: Analysis team, Design team, Implementation team, and so on. This sort of organization is common in construction project management and many try to manage software in a similar manner. It is highly structured and formal; each team consists of a separate set of functional specialists. One team completes its work and hands off the project to the next.

The teams communicate by passing formal documents and other artifacts, such as code and test reports, to the team on the next functional level. The work is managed by controlling the document flow. Each specialist works in isolation and focuses on what he or she does best. Each person in the chain is said to “throw” his or her part of the problem “over the wall” to the next person.

Functional communications result in too little communication. The lack of communication results in:

- less than optimal solutions
- no shared responsibility – everyone did his or her job well, yet the result is disappointing
- the product is less than the sum of parts
- products are not built as designed
- the software is hard to maintain or extend
- intellectual property is lost

Pictorially expressed:
**Unstructured communication model**

No defined team structure - everyone is supposed to work together to get the job done. It may develop when a team grows from 3 or 4 programmers to a team of 8 or more without anyone addressing the alterations necessary to maintain viable communications. It may occur when a manager decides to leave the developers alone to do their work. Results in too much communication:

- the more people on a project, the less overall productivity (Fred Brooks)
- inability to predict or meet schedules
- products not designed, resulting in a system that is expensive to maintain or extend

Inexperienced, immature development organizations often adopt an unstructured approach. They adopt the idealistic view that a bunch of smart developers “don’t need no stinkin´management”. In previous jobs, they may have been victims of a rigid functional project. In any case, they do not know how else to proceed.

Pictorially:

![Unstructured Communication Model](image)

**Figure 16. Unstructured Communication Model**

**Product team communications model**

The product team consists of overlapping teams that own the various processes. The product team model has its origins in manufacturing development, particularly the Quality Functional Deployment (QFD) movement. These product teams are called Integrated Product Teams or Integrated Process Teams (IPTs). Each team is
responsible for a major activity of the development process: one team might be responsible for system design, one for the low-level design and implementation of the subsystems, another for system testing and product delivery. A program team might coordinate all of the project’s activities. Ad hoc teams may be organized to focus on special problems that arise during development. These teams will maintain their membership throughout the project.

Most project members belong to more than one team - the system architect might lead the design, but also be a member of the system test team.

IPTs consist of the stakeholders, those who have an interest in the activity, not just the activity owner. The activity owner leads his or her IPT.

Communication is enhanced by the overlapping membership - the system architect could speak for the intent of the requirements team to the design team. He or she could also bring the concerns of the implementation team to the attention of the requirements team.

Pictorially:

![Figure 17. Product Team Communication Model](image)

Communication Methods

Possible communication methods are presented in the next table:
### Table 9. Communication Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Pictorially</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interactive communication - synchronous or multidirectional method, for example meetings, instant chats, electronical social messaging, telephone calls, forums, conferences</td>
<td><img src="image1.png" alt="Diagram" /></td>
</tr>
<tr>
<td>2. Push communication - no way of immediately giving feedback or seeking clarification, for example e-mails, voice mails, newsletters, memos, reports</td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
<tr>
<td>3. Pull communication - sender must seek out the information at his or her discretion, for example web sites, intranet repositories, podcasts, project libraries, e-learning materials</td>
<td><img src="image3.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

### Communication Technology

Choice of communication technology is determined by:

- temporal requirements of information
- availability of technology
- technological competency of project members
- project duration and environment

Project costs are depending on the choice.

### Modalities in Communication

- Physical proximity
- Three-dimensionality
- Smell
- Sensation of movement
- Touch
- Sound
- Visuals

The impact or removing modalities is as follows:

- Remove only physical proximity – video-based communication
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- Remove the visuals (use a telephone) – losing of drawings, gestures, facial expressions, sight and the muscle tone, proximity cues, ability to link speech with action
- Remove voice (use e-mail) – losing vocal inflection, ability to pose for effect, to check for interruptions, to speed up or slow down t make a point, to raise tone or volume to indicate surprise, boredom, or the obviousness of the transmitted idea
- Remove the ability to ask questions (but possibly reinstate one of the above modalities) – the sender must guess what the receiver knows, doesn’t know, would like to ask, and what an appropriate answer to the guessed question might be – all without feedback
- Remove visuals, sound, timing, kinesthetic, cross-modality timing, question-and-answer, and you get … paper

Making use of modalities (cold and hot communication channels) pictorially:

![Diagram of communication channels](image)

**Figure 18. Cold and Hot Communication Channels**
Communication tools enabling collaboration are presenter on the next figure:
Figure 19. Example of Communication Technologies

Example of communication tools used in agile approaches is illustrated on the next figure:

Figure 20. Example of Agile Communication Tool

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