CHAPTER 13

PROJECT KNOWLEDGE MANAGEMENT

Project Knowledge Management includes processes required to ensure that all the works performer by project will have needed knowledge and collecting newly created knowledge for use by future project.

Figure 13-1 provides an overview of the Project Knowledge Management Processes, which include the following:

13. 1 Organizational Knowledge Analysis – Assessment of organizational knowledge assets in order to make decision of project initiation.

13.2 Project Understanding – Defining knowledge needed to perform a project.

13.3 Plan Knowledge Management – Detailed definition of actions performed over knowledge needed for project execution.

13.4 Knowledge Mobilization – Acquiring knowledge needed for project execution.

13.5 Knowledge Delivery – Delivering knowledge necessary to perform project tasks.

13.6 Knowledge Summarization – Collecting knowledge developed in project and storing it for use by other projects.

These processes interact with each other and with the processes in other Knowledge Areas. Each process can involve effort from one or more persons, based on the needs of project. Each process occurs at least once in every project and occurs in one or more of the project phases. Although the processes are presented here as discrete components with well defined interfaces, in practice they overlap and interact in the way not detailed here. Process interactions are discussed in detail in Chapter 3, Project Management Processes.

The processes of project knowledge management have nature other than other project management processes. As any activity in each process need some knowledge, it must be provided to it or developed in order to enable activity execution. It means that some processes of project knowledge management must be fully executed before completing (or even initiating) other activities. Thus, some project knowledge management processes must be performed in an informal way, before any planning. Knowledge management processes are intertwined with all other management processes.

There are several types and categories of knowledge needed for project execution. This knowledge may be divided into three main parts:

- Domain knowledge,
- Project management knowledge,
- Knowledge about project environment.

Domain knowledge is all the knowledge needed to develop project product (or services). Project management knowledge is all the knowledge needed to perform managerial tasks; it is

further divided into ten knowledge areas[1] described in PMBoK®Guide. Knowledge about project environment includes knowledge about organization performing project and its environment (business, legal, social etc.)

Not all the project knowledge is documented in repositories. Its substantial part is located in project team members' minds. There are two main reasons for which this knowledge is not codified. The first is that there was no need nor requirement to codify it. The second is that a person possessing knowledge may not be conscious of having it. Successful project knowledge management deals with codified, documented in repositories knowledge as well as with individual knowledge possessed by project team members.

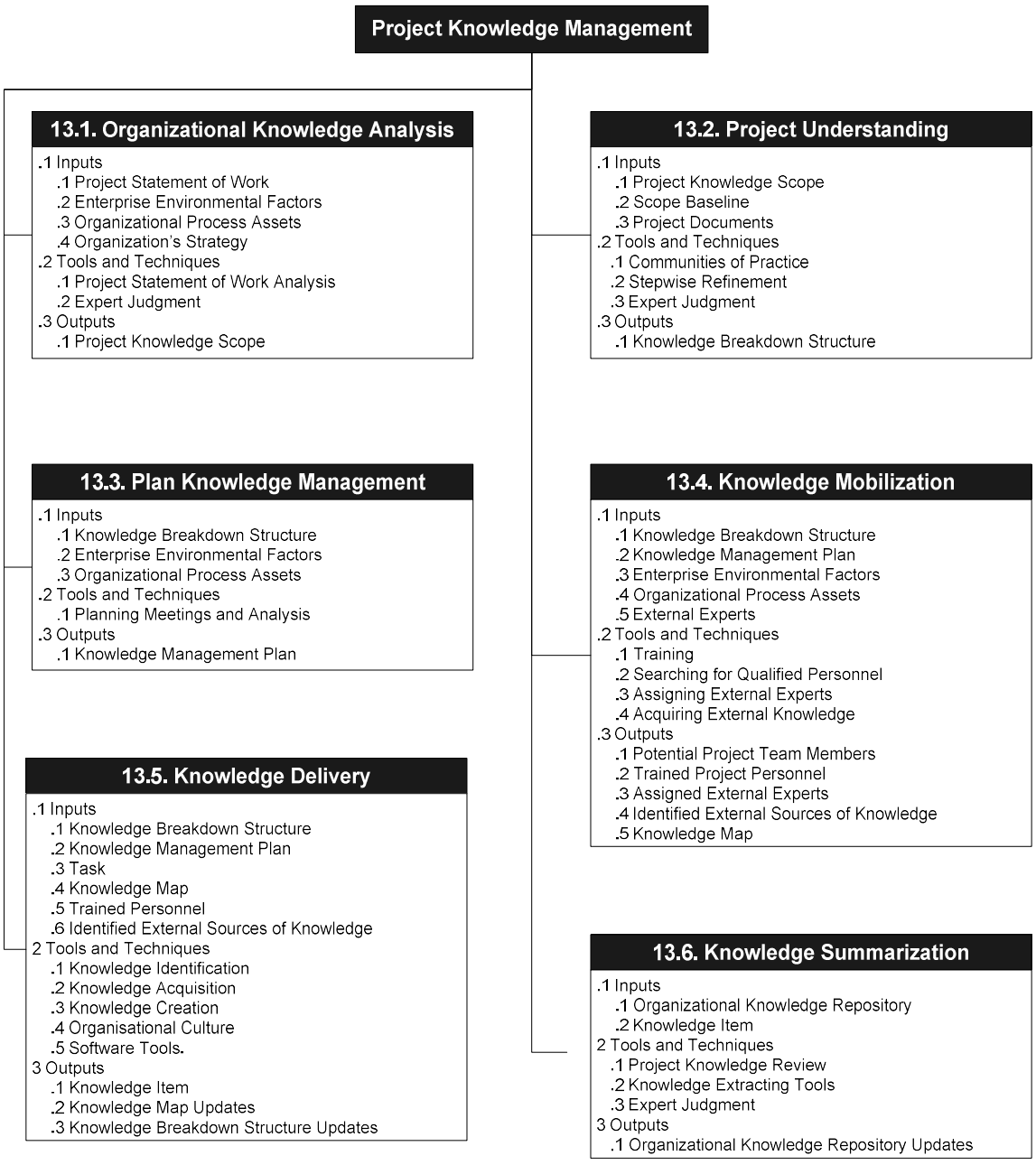

Figure 13-1 Project Knowledge Management: Inputs, Tools & Techniques, Outputs

[1] Including the area of project knowledge management.

13.1 Organizational Knowledge Analysis

Organizational Knowledge Analysis is the process aiming at defining knowledge areas needed to perform a project. Knowledge about the internal and external environments in which the project would be executed is collected. Project's statement of work is analyzed in order to identify project knowledge areas, which define project knowledge scope. Knowledge resources possessed by the performing organization, in codified for as well as possessed by organization members, are analyzed in order to compare them with project knowledge scope. The next element of knowledge processed by this process is the knowledge about organization strategy that primarily covers its business goals. These components together are used for defining Project Areas needed for project execution (Project Knowledge Areas, PKA). Lack of knowledge from given PKA does not have to preclude project execution – when PKA is aligned with organization's strategy, executing a project may be the way for acquiring this knowledge. The definitions of Project Knowledge Areas are used later for defining requirements for project staff.

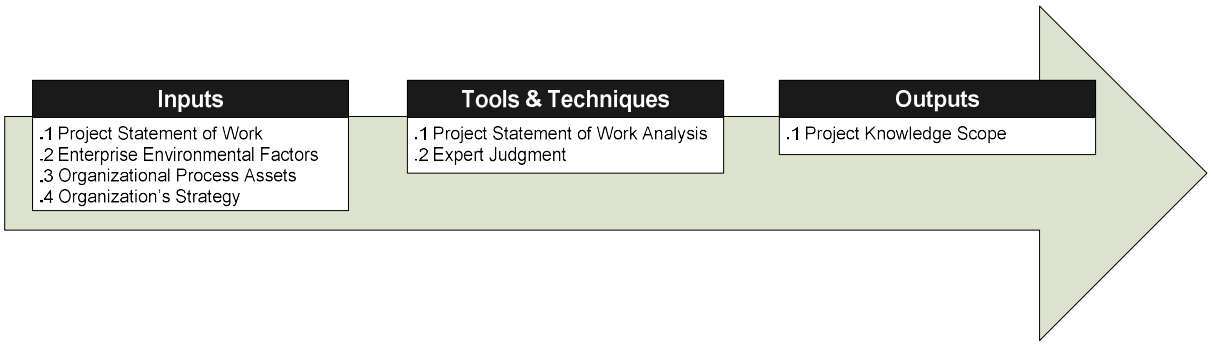

Figure 13-2 Organizational Knowledge Analysis: Inputs, Tools & Techniques, Outputs

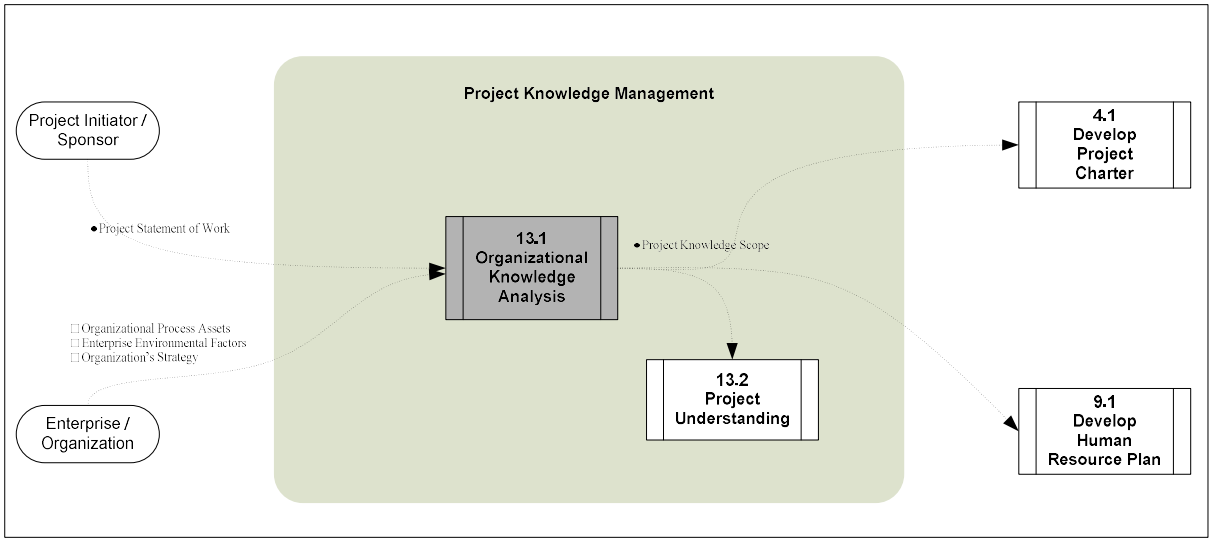

Figure 13-3 Organizational Knowledge Analysis Data Flow Diagram

13.1.1 Organizational Knowledge Analysis: Inputs

.1 Project Statement of Work

Described in Section 4.1.1.1.

.2 Enterprise Environmental Factors

Described in detail in Section 1.8. These factors define the environment in which potential project will be executed. Knowledge about any of these factors may be needed to make proper decision about project initiation.

.3 Organizational Process Assets

Described in detail in Section 2.4.3. Organizational process assets in fact define all the knowledge possessed by an organization about the ways of projects execution. Proper set of these assets is necessary for project execution.

.4 Organization's Strategy

Document defining the main goals of the organization and ways of achieving them.

13.1.2 Organizational Knowledge Analysis: Tools and Techniques

.1 Project Statement of Work Analysis

Elements of project statement of work are analyzed. For each component of statement of work areas of knowledge needed to its execution are identified.

.2 Expert Judgment

Described in Section 4.1.2.1.

13.1.3 Organizational Knowledge Analysis: Outputs

.1 Project Knowledge Scope

Project knowledge scope is the sum of project knowledge areas. Project knowledge area is a scope of knowledge needed to perform element of statement of work. For execution of each element of statement of work one or more project knowledge area may be needed. Any project knowledge area may be needed for execution of more than one element of statement of work. High-level description of project knowledge areas may contain:

- General characteristics
- Source (localization) of knowledge (e.g. organizational knowledge repository, personnel possessing this knowledge, external sources of knowledge)

13.2 Project Understanding

Project understanding is the process of determining which knowledge will be necessary for execution of project work and documenting this knowledge. At the beginning of project planning some knowledge may be owned by the executing organization, external sources of other may be known and some knowledge may not exist at that time. The process of Project Understanding classifies needed knowledge into these three categories.

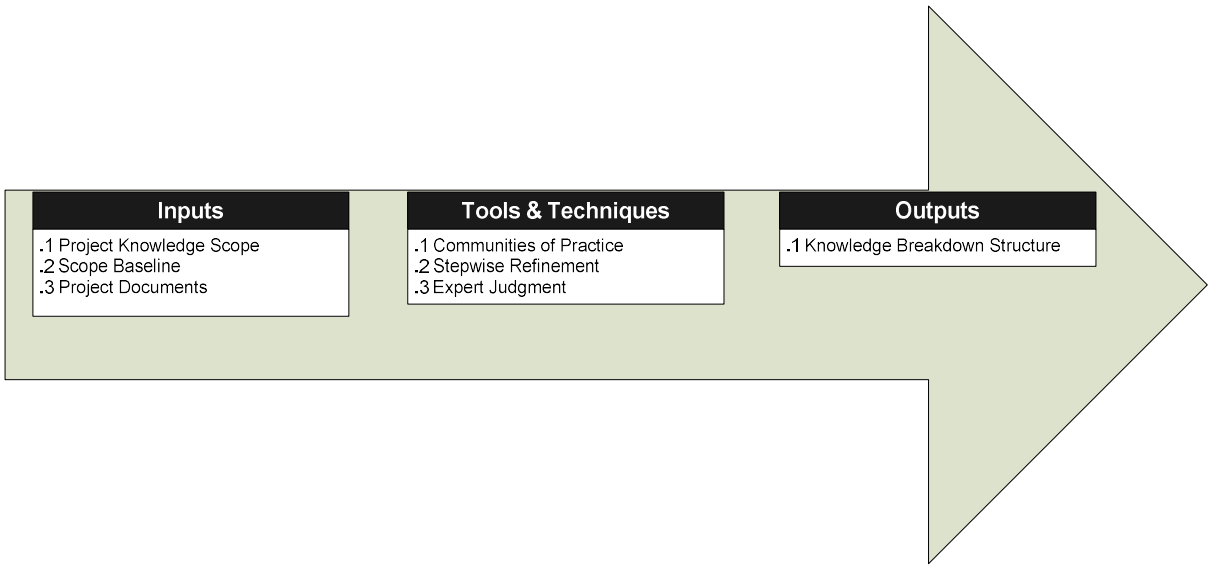

Figure 13-4 Project Understanding: Inputs, Tools & Techniques, Outputs

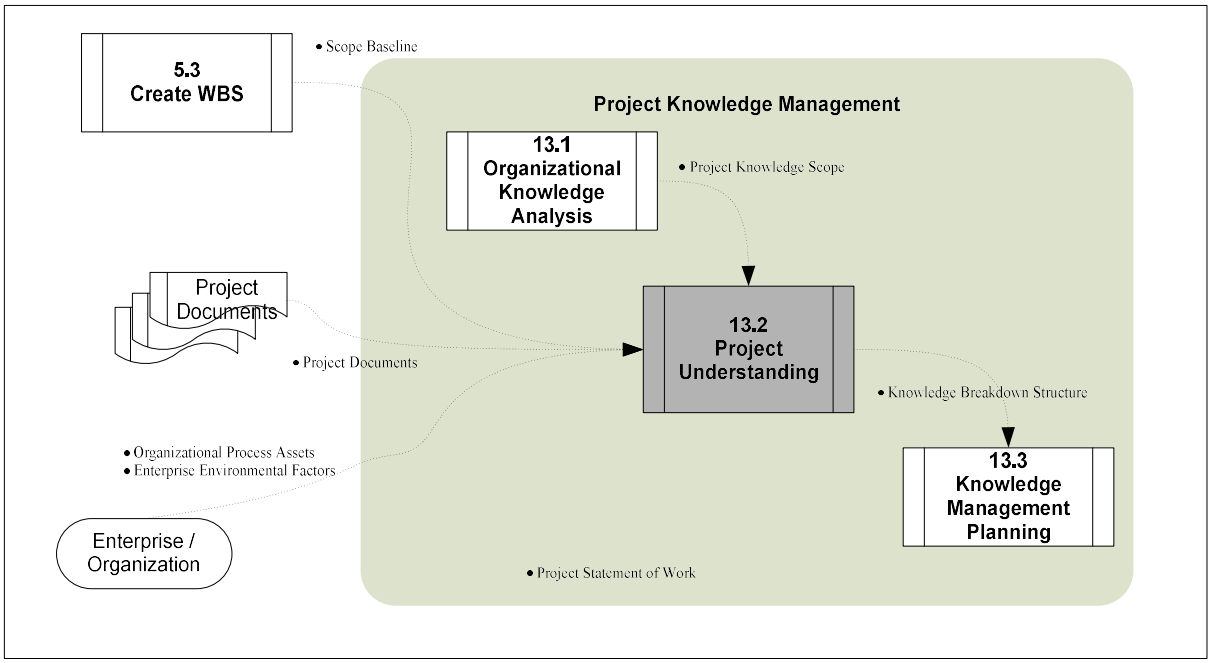

Figure 13-5 Project Understanding Data Flow Diagram

13.2.1 Project Understanding: Inputs

.1 Project Knowledge Scope

Described in Section 4.1.2.1.

.2 Scope Baseline

Described in Section 5.3.3.3.

.3 Project Documents

Described in Section 11.2.1.9.

.4 Enterprise Environmental Factors

All enterprise environmental factors described in detail in section 1.8 may influence the project understanding process. The project planning team may need knowledge of any of these factors to learn what is needed to guarantee project success.

.5 Organizational Process Assets

Described in detail in Section 2.4.3. The organizational process assets which may influence the project understanding process are all those which are relevant to given project domain.

13.2.2 Project Understanding: Tools and Techniques

.1 Communities of Practice

Community of practice is a group of people working on voluntary basis on some domain of activity. They develop and cultivate their own practices. A community of practice may be asked for opinion about knowledge needed for project execution. Members of communities of practice classify knowledge into three classes:

- Knowledge existing at the performing organization,
- Knowledge existing outside of the performing organization,
- New knowledge not existing in the organization nor outside of it.

.2 Stepwise Refinement

The knowledge needed for project execution is defined in stepwise manner as the result of analysis of knowledge identified till given moment. The analysis starts from elements of project knowledge scope. They are analyzed together with elements of scope baseline to refine project knowledge.

.3 Expert Judgment

Described in Section 4.1.2.1.

13.2.3 Project Understanding: Outputs

.1 Knowledge Breakdown Structure[2]

Knowledge Breakdown Structure (KBS) is a hierarchical description of knowledge needed for project execution. This is an extension of project knowledge scope. Each area of knowledge defined in project knowledge scope is refined in stepwise mode till the level sufficient for executing project components – WBS elements or activities. Some KBS nodes may be linked with project problems. Several KBS elements may be needed for execution of single WBS element, activity or problem and vice versa: any KBS element may be needed for performing more than one WBS elements (activities, problems).

[2] The concept of Knowledge Breakdown Structure has been suggested to the author by Dr David Hillson, the Risk Doctor.

For each KBS element an information about its existence and accessibility is provided.

13.3 Plan Knowledge Management

Plan Knowledge Management is the process of defining how to conduct knowledge management activities in a project. It describes activities needed to acquire existing (in project team, in organization performing project and outside of it) knowledge, how to develop knowledge which does not exist and is necessary for project execution and describes ways of retaining knowledge developed in given project for use in other projects.

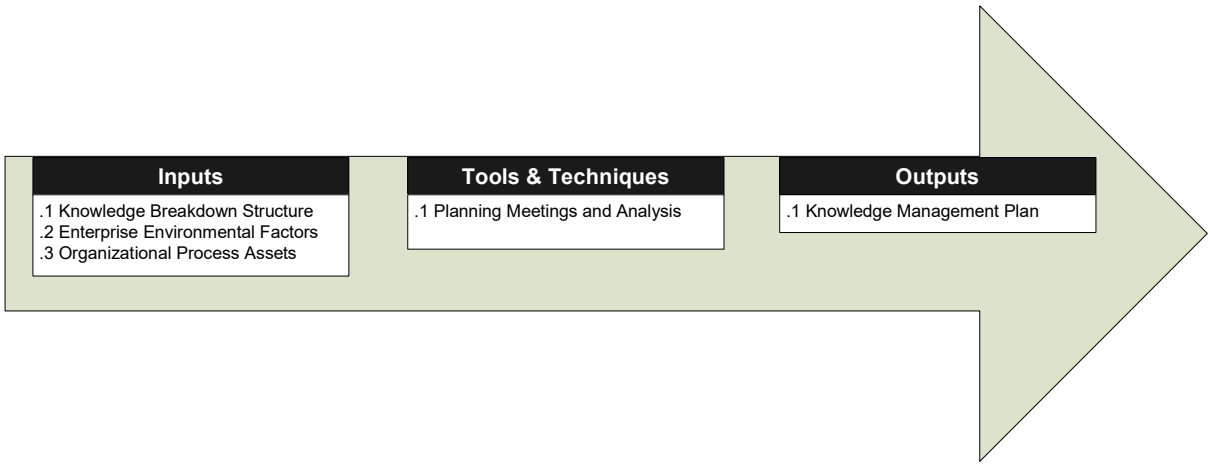

Figure 13-6 Plan Knowledge Management: Inputs, Tools & Techniques, Outputs

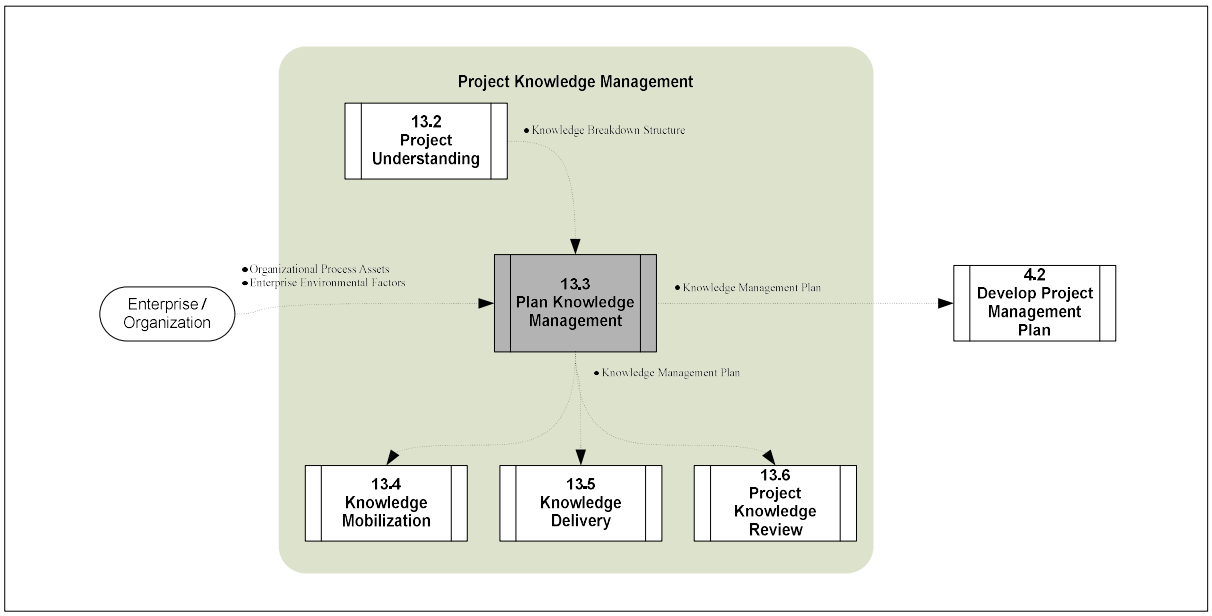

Figure 13-7 Plan Knowledge Management Data Flow Diagram

13.3.1 Knowledge Management Planning: Inputs

.1 Knowledge Breakdown Structure

KBS defines knowledge needed by a project. It defines also which elements of knowledge are accessible and which must be developed by a project.

.2 Enterprise Environmental Factors

The enterprise environmental factors which can influence the Knowledge Management Planning process include, but are not limited to:

- Culture of organization performing project,
- Human capital,
- Software systems supporting information and knowledge processing.

.3 Organizational Process Assets

The organizational process assets which can influence the Knowledge Management Planning process include, but are not limited to:

- Knowledge repositories possessed by an organization,
- Knowledge categorizations and classification,
- Organization knowledge map.

13.3.2 Knowledge Management Planning: Tools and Techniques

.1 Planning Meetings and Analysis

Project management team hold planning meetings to develop knowledge management plan. Attendees at these meetings may include project manager, knowledge broker, selected project team members, subject matter experts, members of communities of practice relevant for project management and project domain and other persons who may contribute to knowledge management in the planned project.

13.3.3 Knowledge Management Planning: Outputs

.1 Knowledge Management Plan

The knowledge management plan describes how knowledge management will be structured and performed on the project. It becomes a subset of the project management plan (Section 4.3.2.1). The knowledge management plan includes the following:

- **Methodology**. Defines the approach, tools and knowledge sources for the project.
- **Processes**. Define the way in which knowledge is identified, acquired, developed, transferred and shared. Distinct processes for knowledge existing in organization, knowledge existing outside of organization and new knowledge are defined. Knowledge review is another, special process having the goal of identifying and storing knowledge developed in a project for use in other projects.
- **Roles and responsibilities**. Define who is included in knowledge management processes. Domain experts (responsible for well defined knowledge areas) and knowledge brokers (people working on connecting sources of knowledge with

team members who need knowledge) are the main roles supporting knowledge management.

- **Communities of practice**. A list of communities of practice who may provide knowledge or take part in developing knowledge needed for project execution.
- **Budgeting**. Assigns resources and estimates funds needed for project knowledge management, including cost of acquiring knowledge and its documenting.
- **Timing**. Defines when and how often the knowledge management activities will be performed. Defines project knowledge management activities which will be included into project schedule. Defines triggers for knowledge management processes.
- **Knowledge description formats**. The structure in which knowledge items are stored in organizations knowledge repository.

13.4 Knowledge Mobilization

Knowledge Mobilization is the process of providing knowledge base for project execution. Potential sources of knowledge are searched for knowledge relevant to project execution. The goal of this process is to prepare project team to perform activities and solve problems which will arrive during project execution. Knowledge mobilization usually provides more knowledge than will be needed for projects: it operates on the level of knowledge areas. Projects are unique endeavors and usually it is impossible to foresee detailed knowledge needed by project. After performing knowledge mobilization process the project team has a common knowledge base. Project staff is ready to work on developing detailed knowledge needed for performing activities and solving problems.

The Knowledge Mobilization process creates a potential of knowledge for a project. In many cases this knowledge is sufficient for executing project activities and is submitted to persons or teams performing project works.

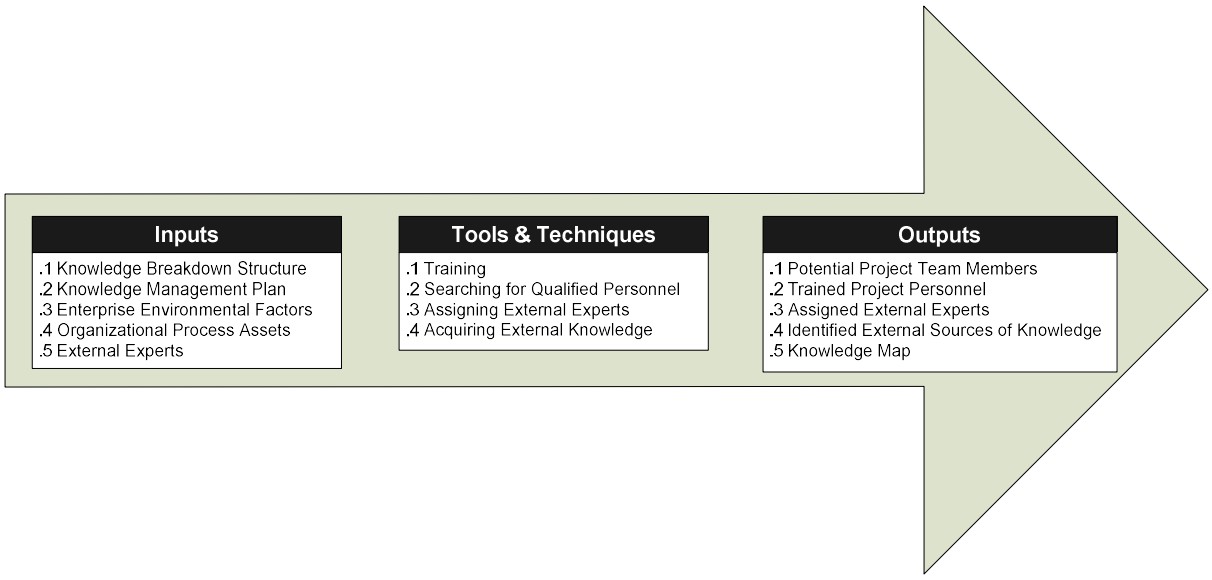

Figure 13-8 Knowledge Mobilization: Inputs, Tools & Techniques, Outputs

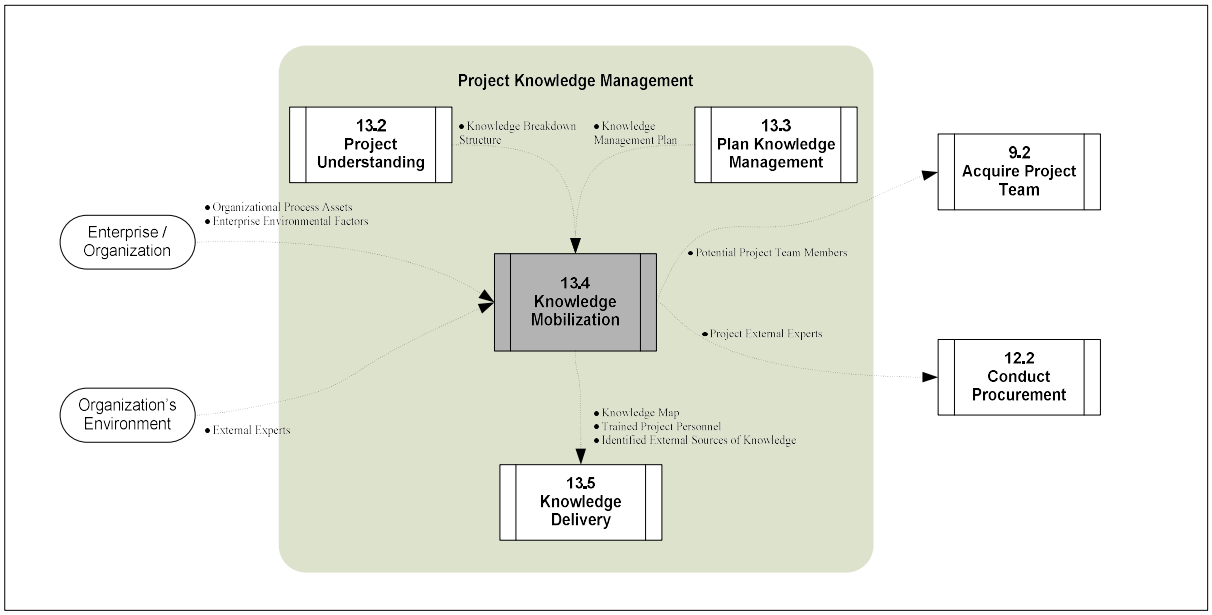

Figure 13-9 Knowledge Mobilization Data Flow Diagram

13.4.1 Knowledge Mobilization: Inputs

.1 Knowledge Breakdown Structure

Described in Section 13.2.3.1.

.2 Knowledge Management Plan

Described in Section 13.3.3.1.

.3 Enterprise Environmental Factors

The enterprise environmental factors which can influence the knowledge mobilization process include, but are not limited to:

- Organization's human resources,
- Project management standards,
- External knowledge repositories (commercial, public),
- Literature (books, journals, articles).

.4 Organizational Process Assets

All the corporate knowledge base may be searched for knowledge needed for project execution.

.5 External Experts

External experts are those people who are not employed by the organization performing project and have knowledge which is needed for project.

13.4.2 Knowledge Mobilization: Tools and Techniques

.1 Training

Those project team members who are not familiar with knowledge needed for given project are trained in order to acquire adequate knowledge.

.2 Searching for Qualified Personnel

Resource pool in organization as well as outside organization are searched for qualified people. One of possible techniques is networking. Press and internet advertisement are another tool.

.3 Assigning External Experts

Not all the knowledge must be possessed by people who are employed by a project. Sometimes it is more effective and efficient to nominate external experts who will advise only on case when their expertise is really needed. Such experts are usually nominated on the basis of interpersonal relationships (networking). Public advertisements are applied not too often.

.4 Acquiring External Knowledge

Project team members search for adequate knowledge in any accessible external sources like books, periodic, journals, articles. This knowledge may be learnt by them or references to knowledge may be stored.

13.4.3 Knowledge Mobilization: Outputs

.1 Potential Project Team Members

A list of people who may bring needed knowledge to project. This list if submitted to the Acquire Project Team process. The effects of Knowledge Mobilization process maybe observed when these people are included into project team.

.2 Trained Project Personnel

Project personnel ready to perform project activities and solve problems which will arise during project execution.

.3 Project External Experts

A group of people not included directly into project team but ready to support them with their knowledge. For each external expert a list of his/her knowledge is defined. The effects of Knowledge Mobilization process may be observed when contracts with these people are signed.

.4 Identified External Sources of Knowledge

A list of external sources of knowledge potentially useful for project: books, articles, journals, knowledge repositories etc.

.5 Knowledge Map

Knowledge map is a version of Knowledge Breakdown Structure with references to knowledge sources and owners for each its element. When the knowledge does not exist after execution of knowledge mobilization process, knowledge map points to a person responsible for its creation.

13.5 Knowledge Delivery

The goal of Knowledge delivery is providing needed knowledge to all project task. A task may be a product development or managerial activity, any risk issue etc. In many cases it is sufficient to deliver knowledge collected or identified in knowledge mobilization process. If this knowledge is not sufficient, new knowledge is developed for the task. Each task may need several knowledge items (called micro-knowledge). Knowledge delivery process is performed separately for each such knowledge item.

While knowledge mobilization process deals with general knowledge needed for project execution, the knowledge delivery process is focused on particular knowledge needed for performing given project task.

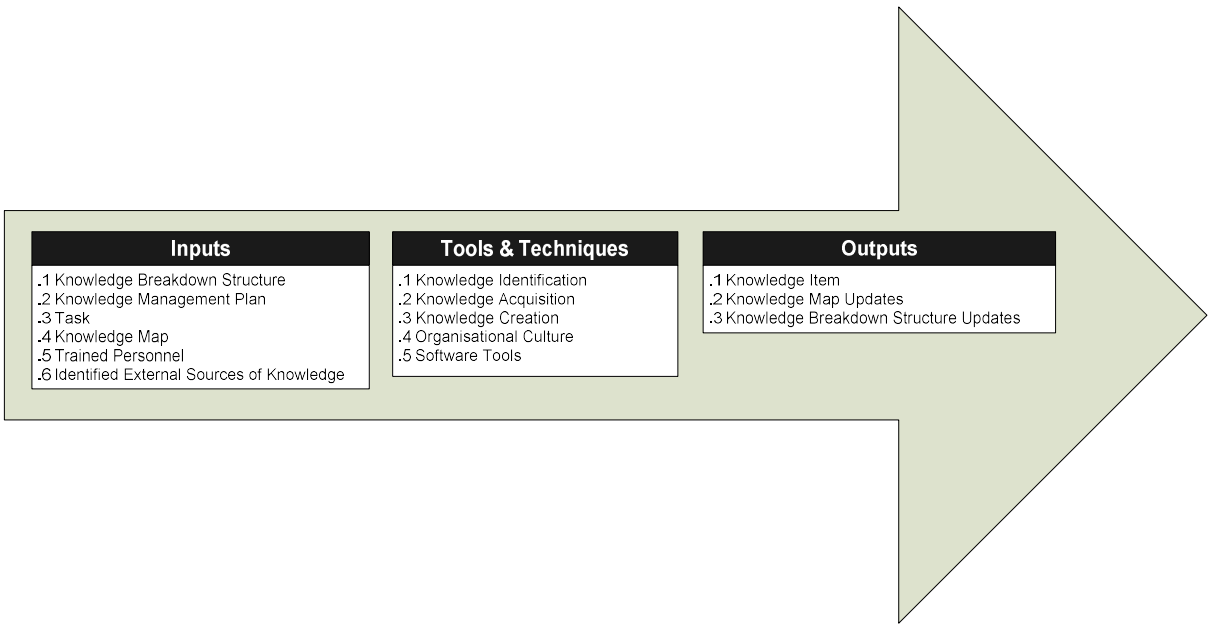

Figure 13-10 Knowledge Delivery: Inputs, Tools & Techniques, Outputs

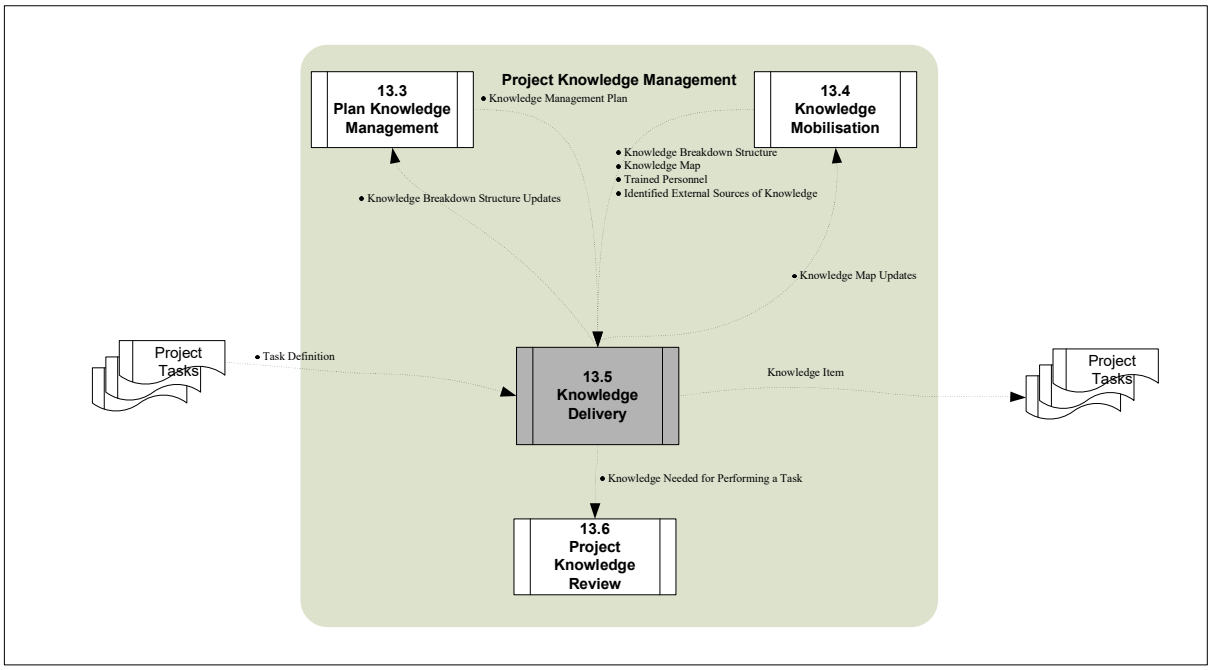

Figure 13-11 Knowledge Delivery Data Flow Diagram

13.5.1 Knowledge Delivery: Inputs

.1 Knowledge Breakdown Structure

Described in Section 13.2.3.1.

.2 Knowledge Management Plan

Described in Section 13.3.3.1.

.3 Task Definition

A task may be a product development or managerial activity, any risk, issue etc. Each task needs adequate knowledge for its execution. There may be several knowledge items needed for executing one task.

.4 Knowledge Map

Described in Section 13.3.4.5.

.5 Trained Personnel

Described in Section 13.3.4.5.

.6 Identified External Sources of Knowledge

Described in Section 13.3.4.5.

13.5.2 Knowledge Delivery: Tools and Techniques

.1 Knowledge Identification

Knowledge identification targets the precise specification of needed knowledge. The characteristics of knowledge needed to perform a task determine its results. The knowledge itself here is not the result. Knowledge identification may be performed

by the person executing given activity, by his/her superior or collectively by project team or any group of this team.

.2 Knowledge Acquisition

Knowledge acquisition means getting knowledge from outside the team performing the task. The knowledge may be acquired from the organization's own knowledge repository, may be transferred directly from people with the needed knowledge, or it may be acquired from an environment outside the organization (e.g., from global standard, book, article etc).

.3 Knowledge Creation

Knowledge acquired from outside the project team is often not sufficient to perform a planned task. The knowledge may generally not exist, or be too general, lack detail, or it could relate to a similar case but not be identical to the current project and the one to which it should be applied. In such cases, new knowledge is created. Knowledge creation may develop new micro-knowledge or replace the current content of knowledge with new content. Knowledge creation is performed on the basis of existing knowledge possessed by a subject and the knowledge acquired from outside sources for the needs of performing a given task. Knowledge creation may be performed by an individual or collectively by project team or any subset of it.

.4 Organizational Culture

Organizational culture is the combination of norms, attitudes, beliefs and values shared by organization’s members. Organizational culture controls behavior of organization members. In the domain of knowledge management organizational culture influence such factors like willingness to share knowledge, appreciation for knowledge creation, or attitude to innovation and tolerance for errors.

.5 Software Tools

Software tools support knowledge delivery. The main types of software tools that may be used for supporting project knowledge management are: project management systems, knowledge repositories, groupware applications, expert seeking systems, modeling systems, project intelligence systems, teaching systems, and knowledge portals.

13.5.3 Knowledge Delivery: Outputs

.1 Knowledge Item

Knowledge needed for performing a task or its part.

.2 Knowledge Map Updates

Knowledge map updated with info about new knowledge items accessible to project team.

.3 Knowledge Breakdown Structure Updates

After developing new knowledge, the KBS may be updated with this knowledge.

13.6 Knowledge Summarization

The process of knowledge summarization, which aims to collect the knowledge produced by a project, is performed in all the other phases of project knowledge management. New knowledge may be developed in every project task, but as the project progresses there is more and more knowledge to collect. Project review is the most frequent technique used to collect new knowledge.

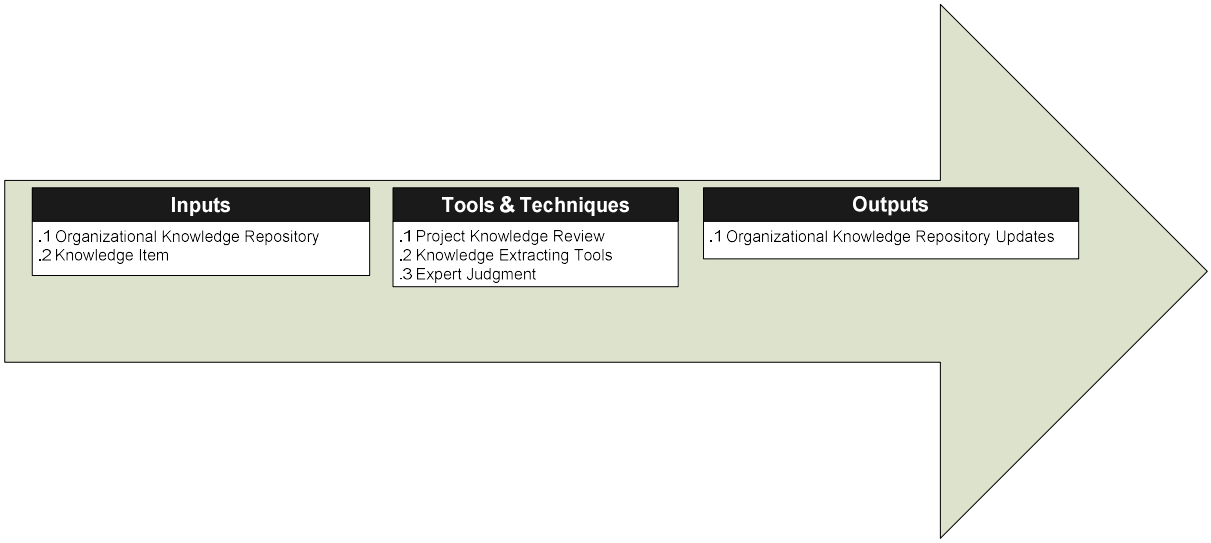

Figure 13-12 Knowledge Summarization: Inputs, Tools & Techniques, Outputs

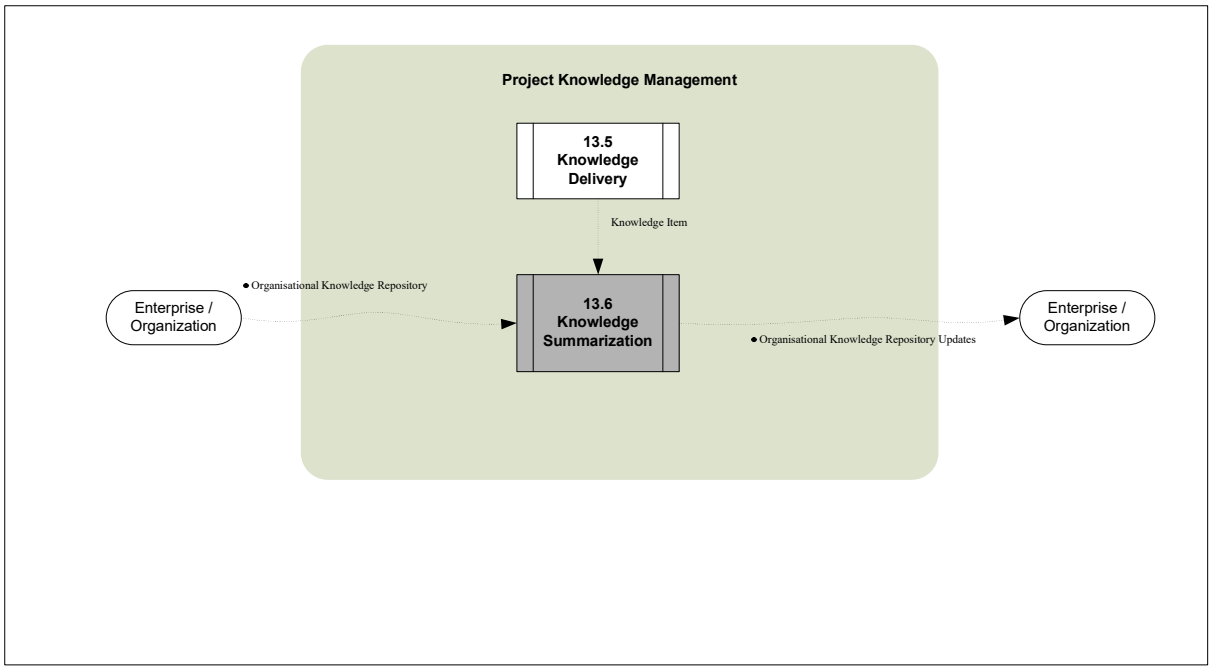

Figure 13-13 Knowledge Summarization Data Flow Diagram

13.6.1 Knowledge Summarization: Inputs

.1 Organizational Knowledge Repository

A knowledge repository collecting knowledge needed for project execution.

.2 Knowledge Needed for Performing a Task

Described in Section 13.5.3.1.

13.6.2 Knowledge Summarization: Tools and Techniques

.1 Project Knowledge Review

Project knowledge review starts with defining it. The decision of its execution is made. A responsible person is nominated. Review goal, scope and timing are defined. After making this decision the detailed review plan is developed. All the team members and persons from outside this team participating in it are pointed out. The detailed set of actions to be performed is defined and their schedule is developed. Once the review has been planned, the initial knowledge is acquired by the review team, especially by the people from the organization level taking part in review. The basic documents are reviewed, interviews with selected members of project management team may be performed. After acquiring initial knowledge, the substantial new knowledge is defined. This knowledge is extracted usually during meetings of all or selected project teams. Meetings are facilitated by knowledge facilitators. The new knowledge is described, classified, categorized and placed in organizational knowledge repository. The knowledge is used to modify organizational routines. Reports describing the new knowledge are sent to interested stakeholders.

.2 Knowledge Extracting Tools

A software tool working towards describing new knowledge. Such tool has user interface enabling project team member for precise description, classification and categorization.

.3 Expert Judgment

Expert judgment are used to assess whether a knowledge item is really new, consistent with organizational knowledge repository and knowledge strategy.

13.6.3 Knowledge Summarization: Outputs

.1 Organizational Knowledge Repository Updates

New knowledge items are input to organizational knowledge repository. The structure of such item description includes but are not limited to:

- Code of knowledge item,
- Classification and categorization of knowledge item,
- Description of knowledge,
- Identification of project,
- Identification and contact to person describing knowledge item.