

# Knowledge Reuse

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## INTRODUCTION

Knowledge reuse is the process through which knowledge is captured, validated, stored, and retrieved. Through the reuse of knowledge, organizations may exploit internal capabilities and improve the effectiveness of their exploration activities (March, 1999). Knowledge reuse processes emphasize the centrality of knowledge within an organization by aligning information systems and communication technologies with human activity and organizational mechanisms, such as learning processes and organizational structures. The process of knowledge reuse can be systematic and planned; however, it can also be carried out in an informal manner through social networks and interpersonal ties (Newell, 2004). While knowledge reuse is explored from an entitative perspective, in which knowledge is generic, accessible, and codifiable, other views, such as social construction (Lave & Wenger, 1991), are also considered in this article. Furthermore, various contexts are considered in this article; however, the emphasis in this article is on knowledge reuse activities in product development and project management contexts.

In this article, the concept of knowledge reuse will be explored. First, a review of recent discussions in the academic and practical literature will be presented. Following this, a discussion about the processes, contexts, mechanisms, and challenges involved in reusing knowledge will be developed. Lastly, future research in this area and conclusions will be offered.

## BACKGROUND

The study of knowledge reuse has evolved from the field of software development through object-oriented software development practices (Banker & Kauffman, 1991) to more strategic management concepts such as modularization and product design (Sanchez & Mahoney, 1996). Several authors (e.g., Markus, 2001) introduced knowledge reuse as an important concept in knowledge management. The practical relevance of knowledge reuse was considered from software and hardware engineering perspectives (Sanderson & Uzumeri, 1994), the management of multi-project environments (Cusumano & Nobeoka, 1998), and as a phase in the evolution of a firm

(Victor & Boynton, 1998). More recently, research has explored additional scenarios for knowledge reuse providing further insight about the reuse of project-specific knowledge (Newell, 2004), templates, information about bids, components, and platforms (Nightingale, 2000).

Various mechanisms and processes have been associated with knowledge reuse. First and foremost, knowledge reuse has been perceived as a process that is based on documenting, verifying, indexing, and retrieving information from repositories (Markus, 2001). Indeed, the information systems approach to knowledge reuse is vital. Nonetheless, knowledge reuse is also an outcome of an informal, people-based activity (Newell, 2004), which can also be complementary to the information system approach. In this respect, the challenges organizations face when attempting to reuse knowledge involve aspects associated with both information systems and human behavior. On the one hand, knowledge re-users face challenges in properly storing, indexing, filtering, verifying, and retrieving information from repositories. On the other hand, these challenges intimately relate to motivational factors to share knowledge, which are human-related factors. The above topics will be discussed in detail in the following sections.

## MAIN FOCUS OF THE ARTICLE

### The Concept of Knowledge Reuse: Some Examples

Knowledge reuse is defined as the process through which knowledge is captured, verified, filtered, stored, and retrieved (Markus, 2001). There are at least three actors involved in this activity: the knowledge creator who creates the knowledge, the knowledge broker or intermediary who prepares the knowledge for reuse by synthesizing and documenting the knowledge, and the knowledge re-user who retrieves the knowledge and re-applies it in different contexts (Markus, 2001). Knowledge reuse activities are arguably related to organizational effectiveness through the exploitation of existing knowledge and resources (Dixon, 2000).

There are several knowledge processes related to the reuse of knowledge. In particular, knowledge sharing and transfer are two knowledge processes that were often

associated with knowledge reuse. Unlike knowledge sharing and transfer, reusing knowledge is an activity in which specific knowledge or design is transferred from a knowledge holder to a knowledge seeker in order to make use and re-apply the knowledge or the design in different contexts. Some car models made by Toyota, for example, share the same components. This was achieved through the transfer of these components between different project teams. In such an activity, a knowledge base will be populated with information about designs and components; and through a knowledge search mechanism, a re-user will be able to verify, retrieve, and reapply a particular component. In this reuse activity, a modification of the reused design may take place in order to adjust the reused design to the requirements and specifications of the new product.

## **Advantages and Disadvantages in Reusing Knowledge**

The advantages associated with the reuse of knowledge are many. By reusing knowledge, organizations may also avoid “reinventing the wheel” in terms of products, components, templates, and processes, thus freeing up resources to other core activities, be these customer responsiveness or innovation. In the context of product development, some more specific contributions were associated with the reuse of knowledge such as lower risk in new product development and a robust design (Nightingale, 2000), shorter time to market, reduced R&D costs, and higher responsiveness to customer needs (Datar, Clark, Sunder, Surendra, & Kannan, 1997; Nayak, Chen, & Simpson, 2000).

However, reusing knowledge may also bring stress to organizations. Excessive exploitation, in particular, may lead to a trap in which organizations that operate in “sub-optimal stable equilibriums” and enjoy the cost effectiveness associated with the reuse of knowledge may suffer from a lack of explorative activities that are crucial for the future development of organizations (March, 1999). Furthermore, information distortion, in the form of missing information or false information, could possibly negatively affect the reuse process and outcome (Carley & Lin, 1997). Therefore, to avoid these pitfalls, organizations require an understanding of the various aspects involved in knowledge reuse, and may design their internal processes and systems to respond to such challenges.

## **The Process of Knowledge Reuse**

Several processes are involved in the reuse of knowledge. From an information systems perspective (Markus, 2001), the reuse of knowledge is based on the use of repositories

and may involve four processes: First, knowledge is captured through documentation, something that can be a by-product of the work process or as an intentional activity using information systems. Capturing knowledge can also include filtering knowledge and preparing the knowledge for future reuse. Second, knowledge is classified and formatted by relating the content to existing and new classification schemes, and through the contextualization and de-contextualization of the content. Third is distributing the knowledge by either pull or push mechanisms. Populating a repository is an example of a pull mechanism, while an automatic e-mail that informs knowledge workers about project management templates available to reuse is a push mechanism. The reuse activity is the last stage in which the re-user is (re)applying the knowledge and updates the knowledge source with contextual context that may serve future re-users.

From a learning perspective (Prencipe & Tell, 2001), the reuse of knowledge can take place at three levels of the organization—individual, group or team, and organizational—through mechanisms that relate to experience accumulation, knowledge articulation, and knowledge codification. Knowledge reuse is more systematic and exploitative in nature when the learning is based on knowledge codification at the three levels of the organization, and tends to be more explorative in nature when the learning is based on accumulative experience at the individual level.

From a strategic management perspective (Victor & Boynton, 1998), knowledge reuse is a step towards building sustainable and dynamic capabilities. A full renewal lifecycle of a product from a knowledge-based perspective may consist of the creation of knowledge, the transformation of new knowledge into modular products and components, and the reuse of these modules, according to market needs, by reconfiguring and re-applying knowledge.

Achieving successful knowledge reuse requires the involvement of each of the aspects mentioned above. Information systems aspects are important for the storage and retrieval of the knowledge, while the learning aspects are key for the improvement of reuse activities. The following section will address the contexts within which knowledge reuse may occur.

## **The Context of Knowledge Reuse**

Knowledge reuse may take place in different contexts, such as between organizations (inter-firm knowledge reuse) or within an organization (intra-firm knowledge reuse). Sharing knowledge and designs between firms is not free of challenges. Issues pertaining to trust between suppliers of a supply chain may impede the sharing of knowledge. Furthermore, proprietary issues may restrict

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