

A framework to evaluate how Management Games improve Knowledge Management Effectiveness

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ABSTRACT

Knowledge-intensive organizations realize that 'knowledge' is a strategic resource that gives them sustainable competitive advantage and helps them achieve long-term organizational goals. These organizations use knowledge management (KM) to encourage the creation and sharing of knowledge resulting in improvements in productivity, innovation, competitiveness, and relationships among people. This paper investigates what role management games play in knowledge-intensive organizations and how they can be used to improve KM effectiveness. We present a theoretical framework that allows answering the following question: 'How can management games be used to improve the effectiveness of KM in knowledge-intensive organizations?'

Keywords

Knowledge-intensive Organizations; Knowledge Management; Management Games

INTRODUCTION

Most organizations realize that 'knowledge' is a strategic resource that gives them sustainable competitive advantage and helps them achieve long-term organizational goals (Na Ubon and Kimble, 2002, p. 1). Therefore, the creation, sharing and protecting of knowledge are vital to the health of a modern organization. In particular, knowledge-intensive organizations depend upon the generation, utilization and uniqueness of their knowledge base, so that these processes take on added significance in those organizations (Donaldson, 2001, p. 956).

Knowledge-intensive organizations are organizations where the fundamentals are formed by professionals, who, with the help of existing knowledge, try to develop new knowledge, store knowledge, apply knowledge and sell knowledge in favor of themselves and internal or external customers (Weggeman and Boekhoff, 1995, p. 80).

Knowledge creation is a critical competitive weapon in today's global marketplace; without a constant creation of knowledge, a business is condemned to poor performance. Organizations need to distinguish themselves through KM strategies. KM strategies are necessary to facilitate knowledge enablers; they determine how to utilize knowledge resources and capabilities (see Choi and Lee, 2002). Nonaka et al. (2000) view organizations as entities that create knowledge continuously, rather than mere information-processing machines. They state that continuous knowledge creation out of firm specific capabilities is the key to success in innovative organizations. With the view of an organization as an entity that creates knowledge continuously, they developed the knowledge-creating process to understand the dynamic process in which an organization creates, maintains and exploits knowledge. Encouraging this process of knowledge creation is a KM strategy (Na Ubon and Kimble, 2001, p. 2).

The knowledge-creating process describes how knowledge is created through interactions among individuals and between individuals and their surrounding environment. In management games participants interact with each other and their environment in order to solve complex, ill-defined problems (Geurts et al, 2000). Therefore, management games can be used to facilitate the knowledge-creating process by serving as a platform for knowledge creation. The objective of this paper is to develop a theoretical framework to analyze how management games improve the effectiveness of KM in knowledge-intensive organizations.

The remaining sections of this paper are structured as follows. In the next Section, key literature regarding KM in knowledge-intensive organizations is reviewed. The Knowledge Governance Framework (KGF) and the knowledge-creating process are introduced. We next discuss key characteristics of games, simulations and management games respectively. The key contribution of this paper is the presentation of our research model to analyze how the effectiveness of KM can be improved using management games. We conclude by summarizing the main components of our model and pointing out future research to validate the model.

KNOWLEDGE MANAGEMENT IN KNOWLEDGE-INTENSIVE ORGANIZATIONS

Knowledge Management Definitions

The KM literature, which exists now for more than 10 years, is still in considerable terminological disarray. Though this is admissible for an emerging discipline, in the long run some kind of standardized set of terms and meanings should emerge. Unfortunately there are still not many visible signs of this desirable process (Hoog, 2004, p. 1). In this section several definitions of KM will be discussed. These definitions are necessary to understand the underlying concepts of the Knowledge Governance Framework (KGF) and the knowledge-creating process which will be introduced next.

Based on an extensive literature review, Holsapple and Joshi (2001) define KM in the resource-based perspective, where organizations are studied in terms of how their knowledge resources can predict their business performances. Holsapple and Joshi introduce the concept of the 'KM episode' (KME), indicating a process involving some knowledge manipulation, triggered by a knowledge need, and culminating in the achievement of learning. They see, similar to the KGF (see below) an organization as a pattern of interrelated KM episodes.

Davenport and Prusak (2000) define KM as: *'to identify, manage, and value items that the organization knows or could know: skills and experience of people, archives, documents, relations with clients, suppliers and other persons and materials, often contained in electronic databases'*. Davenport and Prusak (2000) state that for most knowledge-managing companies today, the challenge that lies ahead is to integrate knowledge management with the familiar aspects of business: strategy, process, culture, behaviour. They distinguish five challenges:

- Linking knowledge management (KM) and fundamental business strategy, making KM the link between business strategy and business performance. For some organizations this means making knowledge the product of the organization. For organizations where knowledge is not the product this means formulating a business strategy supported by knowledge.
- Linking knowledge to work processes. This should be done by 'baking' the KM process into key knowledge work processes.
- Linking knowledge to culture, by installing measures to stimulate knowledge development and sharing.
- Linking knowledge to behaviour, by promoting the use of knowledge instead of only 'stocking knowledge on the shelves'.
- Linking knowledge to the physical business environment, by creating a physical workspace that stimulates knowledge creation and transfer. They recall Thomas Allen's 'thirty meter rule': two scientists or engineers whose desk are more than thirty meters apart have a communication frequency of almost zero.

Jennex (2005) defines KM as the practice of selectively applying knowledge from previous experiences of decision-making to current and future decision making activities with the purpose of improving the organization's effectiveness. Jennex defines a KM system as a system to facilitate capturing, storing, retrieving and reusing knowledge. Knowledge management activities can be thought of as a structured coordination for managing the development of knowledge effectively. Typically, knowledge development processes include activities such as creation, sharing, storage, and usage (Lee and Choi, 2003, p. 181). Alavi and Leidner (2001) distinguish between four types of knowledge processes: knowledge creation, knowledge storage/retrieval, knowledge transfer, and knowledge application. Out of these four knowledge processes, Krogh et al. (2001) believe knowledge creation and knowledge transfer to be the core knowledge processes. Because the transfer of existing knowledge and creation of new knowledge have become two major management tasks, both should be considered together.

The Knowledge Governance Framework (KGF)

Knowledge governance is the process of controlling knowledge resources aiming to achieve organizational objectives (Smits and de Moor, 2004; Daniels and Smits, 2005). This section reviews theory on the KGF, a model that can be used for the process of planning, controlling and measuring KM activities. The KGF includes knowledge resources, knowledge creation processes (SECI)¹, three types of KM (Operational KM, Maintenance KM, Long-term KM), and organizational objectives. It allows managers to exactly list key knowledge resources in their organizations and, after some reflection, processes of knowledge development.

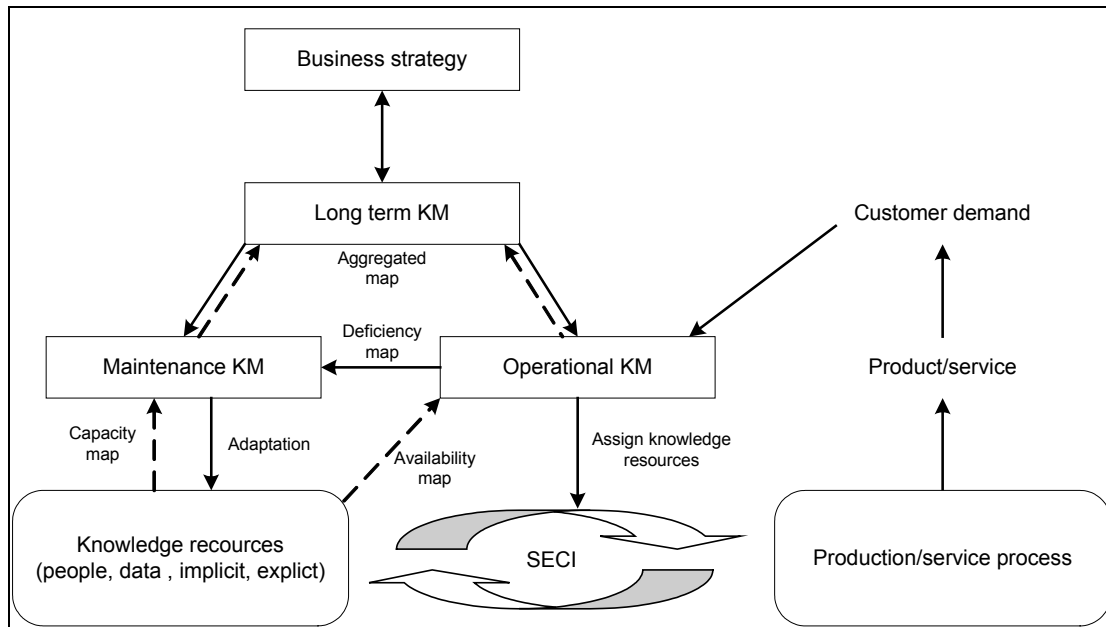


Figure 1 The Knowledge Governance Framework (Smits and de Moor, 2004)

Figure 1 shows – in the rounded rectangles – the knowledge resources, either as ‘available resources’ (lower left side), or ‘in use’ and assigned to a production or service process (lower right side). Knowledge creation processes (SECI), indicated by thick (circular) arrows, through which new knowledge resources are developed. Knowledge resources can be both human and machine-based, such as employees and databases. The central part of Figure 1 shows the three types of KM (Operational, Maintenance, Long-term KM), and their relations with the organizational context (customer needs; products and services of the organization; business strategies). The KM constructs in the KGF model are defined as (Smits and de Moor, 2004):

- *Operational KM* - An operational knowledge manager takes care of the customer demand for knowledge-intensive products or services and forms a project team consisting of knowledge resources and specialized employees who will implement these orders. After a customer request has been received, Operational KM needs an availability map, an up-to date overview of the free and available knowledge resources to create an optimal project team. If there is a difference between the actual needs of Operational KM and the available resources, the gaps will be communicated to Maintenance KM via the deficiency map.
- *Maintenance KM* - A maintenance knowledge manager maintains an optimal level of knowledge resources in the organization by comparing the capacity map (the total set of knowledge resources present in the organization) with the deficiency map. As a result, the knowledge resources may have to be adapted, triggering new KM episodes (see also Holsapple and Joshi, 2001). This can be realized, for example,

¹ Through the SECI process an organization creates knowledge by means of interactions between explicit knowledge and tacit knowledge (Nonaka, 1994).

through training, hiring, buying, and development of knowledge products, social learning, and linking to other resources.

- *Long-term KM* - A long-term knowledge manager evaluates summaries of Maintenance- and Operational KM in the form of aggregated knowledge maps. These results will be matched with the business strategy and objectives, so that a long-term planning can be made (Roos and Roos, 1997). This planning, which is communicated to the other KM processes, contains the KM objectives to be reached and the costs and profits that will be realized.

The links between the three types of KM represent management processes, which consist of indicators (in reports or 'maps'; dotted lines in Figure 1) and corrective actions (control activities; lines). Figure 1 also shows examples of indicators (Smits and de Moor, 2004). The management processes are needed to steer the knowledge creation processes (SECI) in the right direction in order to fulfill customer demand (both internal and external) for knowledge-intensive products or services that is in line with the organization's strategic, tactical, and operational objectives. Thus, these processes allow for the objectives of Operational KM, Maintenance KM, and Long-term KM to be aligned.

The KGF can be used to analyze and improve the 'effectiveness of KM'. KM effectiveness is defined as 'the degree to which the KM objectives for the three KM types are realized'. Long term KM is successful if maintenance KM and operational KM match the intellectual capital indicators derived from the business strategy. Maintenance KM is successful if deficiency map is below certain limits indicated by longterm KM. Operational KM is successful if available knowledge resources can be successfully assigned to fulfill customer demands. Obviously, in order to assess KM effectiveness, KM effects must be determined by measuring aspects of KM such as the knowledge-creation processes (SECI), and the knowledge resources and products created. These measurements, in the form of performance indicators for KM aspects, can be used to compare the current level of effectiveness with the level that is desired, upon which appropriate actions can be taken.

MANAGEMENT GAMES

In this paper we focus on how management games can be used to improve KM effectiveness. The focus will be on how different types of management games influence certain KM types (Longterm, Maintenance, and Operational KM) and knowledge development processes (in particular the knowledge creation process and the knowledge transfer process). Let us first define games, simulations and management games..

Games

In the thirties, the Dutch philosopher Huizinga (1938) provided a great boost to the philosophical thinking on the phenomenon of games. For him, the concept of games is defined by the following elements (Geurts et al., 2000, p. 19):

- a spontaneous action or activity;
- occurring within certain temporal and spatial limits;
- developing according to freely chosen but subsequently compulsory rules;
- the purpose is the activity itself; and
- the activity is accompanied by a feeling of excitement and joy and the awareness that the activity differs from everyday life.

Table 1 summarizes Huizinga's view of the game.

Table 1 Important aspects of the game phenomenon (Geurts et al., 2000)

Informal	People take part on their own initiative and are free to experiment
Defined	The exercise is carried out within a certain time and space
Enjoyable	Participants become enthusiastic and challenged by the exercise
Rules	The activities of participants are carried out within framework of roles and rules
Experiences	Repeated sequence of doing, discussing and redoing

More recently, Leemkuil, et al. (2000) defined games as competitive, situated (learning) environments based on a set of rules and/or an underlying model, in which under certain constraints, some goal state must be reached. Games are situated in a specific context that makes them (more or less) realistic, appealing, and motivating for the players. Important elements that are related to the situatedness of games are validity/fidelity, complexity, risk, uncertainty, surprise, unexpected events, role-play, access to information, and representation form of the game.

Simulations

‘Simulare’ is a Latin word meaning to imitate. Simulating is thus imitating, pretending, or ‘getting away from and coping in an extraordinary way with the rules of everyday life’. Duke (1981 cited by Geurts et al., 2000, p. 20) sees simulation as an attempt to abstract and reproduce central characteristics of a complex system with the aim of understanding, experimenting with and predicting the behaviour of the system. According to Geurts et al. (2000), simulation is a methodology in which models of complex systems are experimented with. Simulation is the process of designing a model of an existing system and carrying out experiments with this model. Models are used to study complex systems. A model is simplified representation of a complex system that facilitates the description and analysis of that complex system (Becker and Goudappell, 1972 cited by Geurts et al., 2000, p. 21). A simulation model is a model that is intended to imitate and analyse the processes in a system. Geurts and van Wierst (1991) use the following definition: ‘*simulation is the representation of the reality that exists in some artefact or other and the exploration of the dynamic properties of that reality through experimenting with the artefact*’.

Management Games

Casimir (1995) defines a management game as: ‘*a game in which participants are responsible for managing an organization in an artificial environment created by computer simulation*’. Participants in a management game can use knowledge of the outside world when playing the game and can use the knowledge gained in the game in the outside world. Thus, in management games participants learn something about a modelled world.

Carson (1969) defines management games as simplified mathematical abstractions of a situation related to the business world. The game participants, either individually or in groups, manage a whole firm or an aspect of it, by making business decisions for successive periods. He classifies these games into two categories, general management games and functional games (Carson, 1969, p. 40):

- *General management games* are designed to teach decision making at the top management level where all major functional areas of the total enterprise are involved in achieving fundamental organizational objectives, such as maximum profit, return on investment, or attainment of certain sales levels or a certain share of the market. Generalised games of this type are designed to teach objective decision making through experimentation, evaluation, and modification.
- *Functional games* are intended to teach specific skills in a particular management area such as marketing, production, inventory control, finance or some other. They are aimed at teaching better decision making at the middle and lower levels of management. In these games, instead of trying to maximise attainment of

some organizational goal, the players are usually working to minimise costs through efficient operation. This type of game is most useful in teaching the value of a specific set of decision rules such as Economic Ordering Quantity (EOQ) in inventory control. Teams normally do not compete with one another in a market, but try to get the highest possible score relative to a perfect operation.

According to Casimir (1995) management games are related to social simulation. The difference between management games and social simulation lies in the number and role of players, the underlying models, and the evaluation of the results. For example, social simulations often foster cooperation rather than competition between teams. Moreover, social simulations may use flexible rules interpreted by arbiters instead of rigid rules enforced by a computer program, and they may use traditional playing materials instead of computers. Because all these characteristics are mutually independent, there is no sharp division line between social simulations and management games.

After extensive research on numerous definitions of gaming/simulation, Geurts et al. (2000), found that most of them can be categorized in three dimensions. These dimensions, which are also applicable to management games, are translated as follows (see Table 3): *the essence*: a management game places people in models; *the function*: in management games people practice communication with each other, supported by an artefact; *the form*: management games are procedures of orchestrated and condensed complexity.

We use the three game dimensions of Geurts to distinguish between three game types, based on the objectives for using a game in a knowledge management setting: (i) games for educational purposes, in a learning setting for students or manager groups, (ii) games for organizational change, in a business setting, e.g. to prepare personnel for a business redesign operation, and (iii) games for policy development, e.g., when a project team prepares a new business plan.

Table 2. Identifying three game types based on the three dimensions and key characteristics in management games (derived from Geurts et al., 2000).

Three dimensions of management games	Key characteristic of the game category	Game type
1. Management games as communication <ul style="list-style-type: none"> • Players learn from each other and from the model • It is a hybrid language 2. Management games as exercise <ul style="list-style-type: none"> • It is a safe environment • It is an intervention • Management gaming is 'looking back' on the future 	The function: practicing communication	Games for educational purposes
3. Management games as a model <ul style="list-style-type: none"> • It is a representation • It provides insight into complex wholes • It analyses relationship between structure and behavior 4. Management games as interaction <ul style="list-style-type: none"> • Actors partly form the situation • Players work from their own perspectives • Simulations are organizational prototypes 	The essence: People in models	Games for organizational change
5. Management games as organized procedure <ul style="list-style-type: none"> • Games are documented, repeatable • Games have a prepared starting point 	The form: orchestrated complexity	Games for policy development

To conclude this section, we summarize the advantages of management games found by Geurts et al. (2000). Management games:

- offer a safe environment in which to experiment with the future: participants can build up trust;
- underline the importance of learning from experience;

- stimulate participants to actively build on their own expertise;
- make problems with a long-term time horizon survivable: the effect of one's own actions are rapidly revealed;
- are eminently suited to perceiving the interaction between many variables, to develop a holistic view of a complex situation;
- make direct feedback of results possible. A 'mirror' is held up to the participant, which makes it easier for them to assess their own behaviour. What someone says he will do and what he actually does are often not the same;
- provide a strong link with day-to-day practice because the design of a management game is based on day-to-day practice; and
- can be used alongside other instruments. Management games do not wholly replace traditional teaching methods. A combination is quite possible and often effective.

THE PROPOSED RESEARCH MODEL

Two knowledge processes are particularly important with regard to the effectiveness of KM in knowledge-intensive organizations: knowledge transfer and knowledge creation (see above).

Knowledge transfer enables knowledge-intensive organizations to realize sufficient knowledge availability at the time and place where the organization needs it. The 'management processes' in the KGF illustrate how knowledge-intensive organizations depend on the transfer of knowledge from different parts of the organization to other parts of the organization in order to function as a whole.

The capacity to *create new knowledge* is a knowledge-intensive organization's most important source of competitive advantage. The knowledge-creating process explains how knowledge creation is a continuous process whereby individuals and groups in the organization share tacit and explicit knowledge. The knowledge-creating process does not only include knowledge creation, but affects knowledge transfer as well.

The newly created knowledge is used to overcome business problems and produce knowledge-intensive products or services, thereby achieving more organizational objectives. Thus, the stimulation of knowledge transfer and knowledge creation processes is a key objective of KM.

Based upon these insights from various theories listed above, we propose the research model as shown in Figure 2. Different types of management games enable top management teams to indirectly communicate the organization's knowledge vision to participants in the game. During the game participants perform management functions (Long-term KM, Operational KM, and Maintenance KM) in a simulated environment. This 'forces' them to answer knowledge vision related questions such as: What should we create? What knowledge resources do we need to create this? How do we acquire these knowledge resources? In the process of answering such questions, knowledge sharing takes place among participants.

Figure 2 shows ten tentative examples of performance indicators for KM effectiveness, either as performance indicators for KM processes (in the upper right block), or as indicators for the knowledge creation and knowledge transfer processes, that –in turn- are influenced by KM processes.

Figure 3 shows example questions related to the three knowledge management processes and the knowledge development processes in knowledge intensive organizations. The questions might be used to clarify and evaluate knowledge management and knowledge development in case studies.

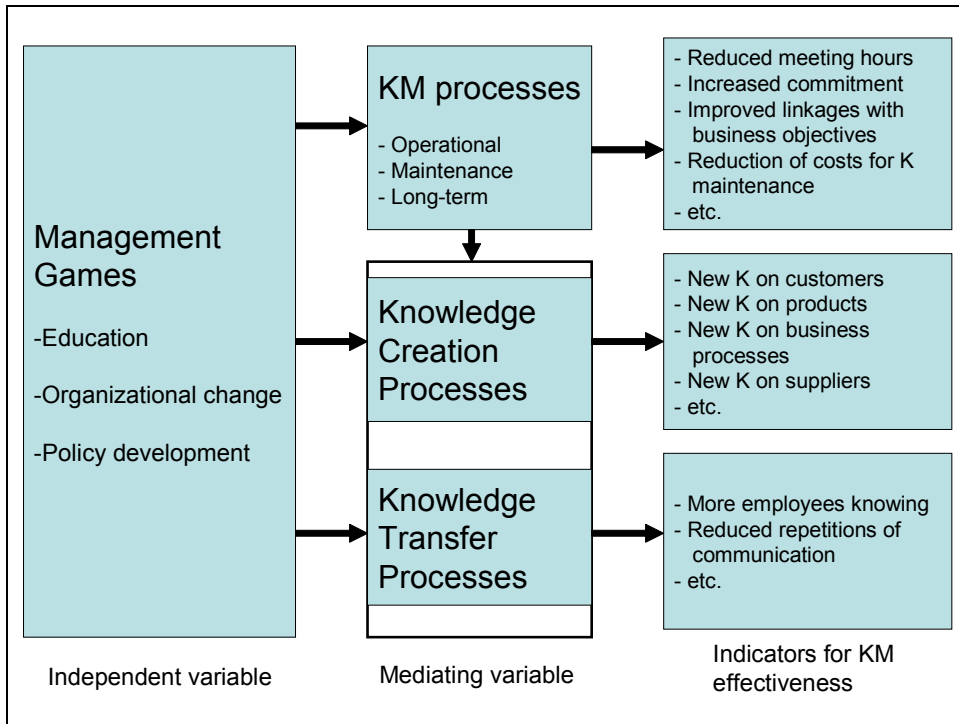


Figure 2. Proposed research model linking management games (3 types) to knowledge management processes (3 types), knowledge creation processes, and knowledge transfer processes. Examples are given of indicators for knowledge management effectiveness (see text).

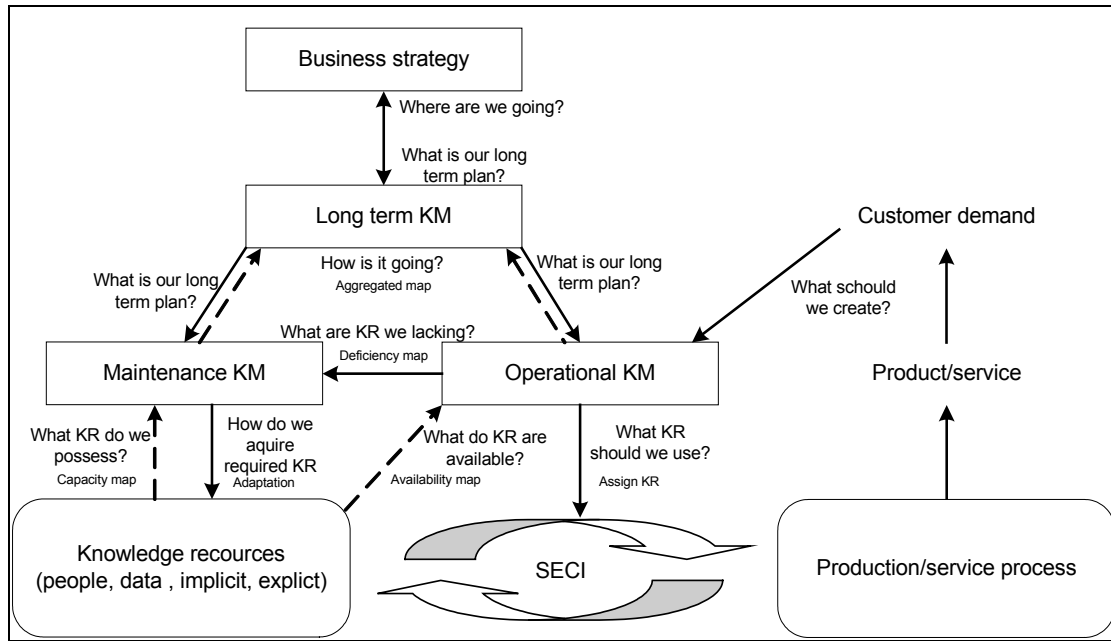


Figure 3 Management games in knowledge-intensive organizations

CONCLUSIONS AND RECOMMENDATIONS

In theory management games can be used to improve KM effectiveness by making a knowledge-intensive organizations reach more organizational objectives through the stimulation of management processes, the knowledge-creating processes, and the knowledge transfer processes. Stimulation of these processes enables organizations to develop the knowledge resources they require to fulfill customer demand for knowledge-intensive products or services that are in line with the organization's strategic, tactical, and operational objectives. This way a management game acts 'a purposeful intervention to realize sufficient knowledge availability at the time and place where the organization needs it by encouraging communication, offering opportunities to learn and promoting the sharing and creation of knowledge'. *In practice* this comes down to the evaluation of management games against 'key indicators' for effective KM in knowledge-intensive organizations using management games, after which recommendations for improvements can be made.

The current research model does not explicitly include culture as a mediating factor for KM effectiveness, as suggested by Jennex and Zakharova (2006). Future research might indicate that cultural factors influence the way management games are used for KM, or that cultural factors change the effects of management games on KM, knowledge creation, and transfer.

We developed a research model in which we distinguish between three types of management games (educational games, games for organizational change, and games for policy development) and how these games influence three KM processes, knowledge creation and knowledge transfer. The framework can now be used to analyze the effect of different types of (existing) management games on KM effectiveness in different business situations.

Future research will focus on validating the hypothesized model, as well as identify measures for KM effectiveness for crisis management games such as the planning game developed by Turoff and co-workers (Turoff *et al.*, 2005).

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