

# The Role of Technological and Organizational Factors in Knowledge Management

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**ABSTRACT** Knowledge is part of nonmaterial assets of enterprise and exists in people and social structures of enterprise. Therefore, knowledge management can increase intellectual and social capital of enterprise in order to gain competitive advantage. Knowledge management is supported by various information and communication technologies through processes of knowledge creation, storage, processing and transfer in enterprise. Effective knowledge management helps an enterprise to react intelligently to threats and opportunities from an environment. Intelligent enterprise is able to gather information from the environment, to transform information to knowledge and to adapt to changes of the environment. Orientation of such enterprise is not only to information technologies, but to people with their behaviours, values and attitudes. The paper considers strategic role of information technologies in knowledge management of enterprise, but also treats organizational, non-technical elements important for knowledge management.

**KEYWORDS** information technology, knowledge management, business strategy, learning, organizational factors

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## I. INTRODUCTION

In traditional economy, land, physical workforce and capital are basic factors of production and national wealth creation. However, in today economy knowledge have become key factor of success and revenue increase. Today many products include intelligent information that improves quality of products and services and better meets customers needs. From microwave oven to car, from telephone to personal computers, these intelligent machines give better service. Today organizations are governed by economy of knowledge, and possession and use of knowledge are sources of the largest competitive advantage. Peter Drucker (1994) argues that in comparing with previous period of economy development, knowledge has become primary factor of production and traditional factors of production are limiting factors rather than factors of advancement. Drucker (1994) further argues that information management is main task full of challenges and could be in many companies key for gaining competitive advantage. Actually, today many organizations perceive that knowledge creation, transfer and management are key for success.

Therefore, knowledge of internal business activities and external environment is key for management of enterprise. Enterprise managing knowledge on effective way can realize advantage over its competitors. This is why knowledge is identified as a main enterprise resource for creation of competitive advantage in which all the other resources are attempted.

Until the end of last century, focus of practitioners and researchers in information systems (IS) field was data and information and how by information technologies (IT) to transform rough data to information for decision making. However, in last years, emphasis is on knowledge which is on higher level than data and information when we consider processing. Knowledge is created when data and information are processed, analysed and interpreted in specific context depending of attitudes, opinions, previous knowledge, experience and subjective estimation of a decision maker. IT gives analytical and methodological framework for data and information conversion to knowledge. (Zhang, Venkatesh, 2017)

Subsistence and development of enterprise depends of its abilities to absorb tokens from environment, to reveal right meaning of the tokens and to undertake adequate actions based on that meaning. Enterprise is deemed intelligent if it has institutional ability to gather, share and get meaning and knowledge from information coming from environment, usually market environment. Thereby categories (knowledge,

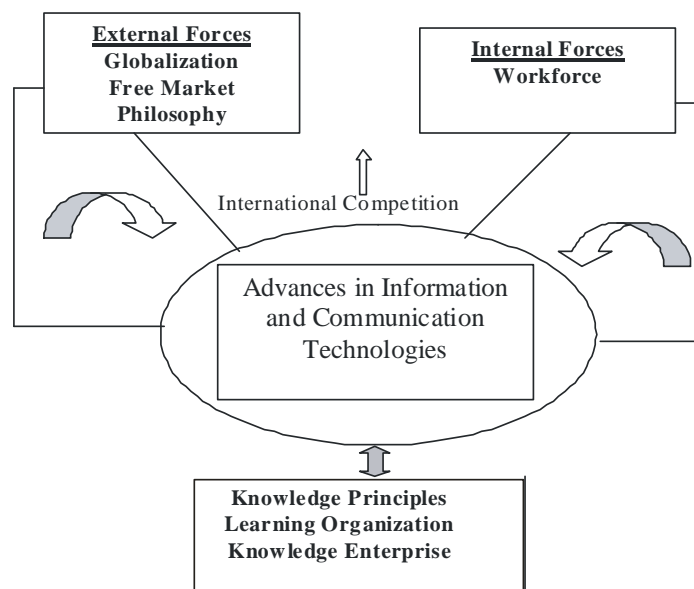
intelligence and learning) relating principally to people are moved in domain of organization which is deemed an entity with ability to learn, acquire knowledge and behave intelligently in response on threats or opportunities coming from environment. In addition every organization is collective of people formally organized to improve its business and to fulfil some business aims by their knowledge and skills. Consequently, focus is more and more moving from technological issues to human issues relating to behaviours and values which people accept. Effective information and knowledge management depends of the human issues.

Great advance in information and communication technologies has undoubtedly facilitated creation, storage, sharing and transfer of knowledge. However, if we too much emphasize importance of technology, and do not include the other critical factors, result could be unsuccessful knowledge management. The paper treats IT as strategic resource for gaining competitive advantage which has the specific role in knowledge management. Besides, the paper signifies importance of the other critical factors, such as business strategy, leadership, organizational structure, culture and learning. These are critical factors for success in enterprise knowledge management. Thus the paper is organised in six parts. In the next part of the paper, relationship between IT and business strategy is analysed , while in the third part factors for assessment of IT strategic role in enterprise are explained. In the forth part of the paper, the role of IT in enterprise knowledge management is considered and in the fifth part the role of organizational or non-technical factors in knowledge management is analysed. In the last part of the paper, concluding considerations relating to strategic role of IT in enterprise knowledge management are given.

**II. IT AS STRATEGIC RESOURCE OF ENTERPRISE**

We evaluate strategic role of IT from aspect of internal business activities and from aspect of competitive environment in which enterprise operates. Enterprise should define information intensity of its business activities and the role of IT in information transformation to knowledge. In addition, enterprise should identify and analyse competitive forces from environment and invent ways to control the forces by IT.

Global capitalistic market rapidly changes political, control and economic obstacles which have prevented creation and productive use of knowledge. Today economy has benefits from contemporary information and communication technologies (Internet, wireless communication, satellites, computer networks, videoconferences, etc.) in exchange of ideas and knowledge inside and between organizations that is increasing efficiency of economic activities. Advancement in the information and communication technologies have facilitated creation, storage and transfer of knowledge. Globalisation, enhanced international competition and philosophy of free market are leading forces of the advancement, as it is illustratively shown on fig. 1.

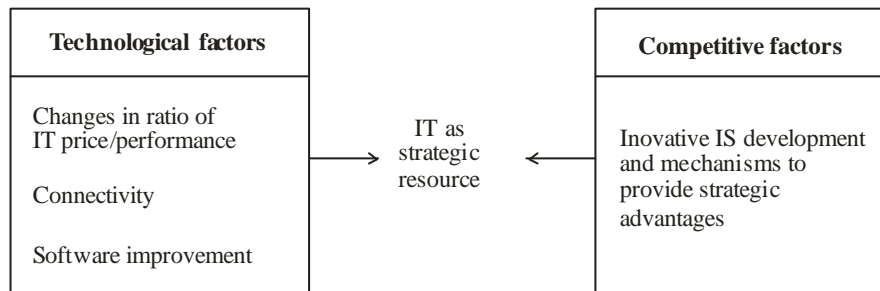


**Fig.1. Knowledge management and IT advancement**

In contemporary business environment it is not question whether IT has strategic role but how to use it in management of enterprise or more precisely, how to integrate business strategy with IS development strategy. Thus, main challenge for top management of enterprise is to use IT and knowledge as enterprise strategic resources in competition with rivals. However, managers in many enterprises regard that ISs have only technical

role relating to efficient processing of operational data which sometime has processed manually. Strategic role of IT in data and information transformation to knowledge needed for intelligent management of organization and gaining competitive advantage on market is not considered. (Orenga-Roglá & Chalmeta 2019)

Every enterprise formulating business strategy by research of competitive environment and analysis of resources for the strategy implementation must take into account influence of IT on the strategy. The influence of the IT is not related only to support of strategy implementation, but strategy formulation, so IT deemed very important strategic resource. The way how IT has been becoming essential strategic resource by impact of technological and competitive factors is shown on fig. 2. (Tavera Romero et al. 2021)



**Fig. 2. IT as strategic resource - competitive and technological factors**

When we consider relationship of IT to business strategy, there are three alternatives: 1. IT is independent from business strategy, 2. IT is reactive to business strategy, 3. IT and business strategy are interrelated. (Abusweilem & Abualoush, 2019)

**1. IT is independent from business strategy.** According the approach, IS development takes place out of strategic context. Design and modification of the systems are independent from enterprise business strategies that implicates minimal participation of IT in strategy formulation and implementation. The approach reflects traditional technical or administrative role of IT, where main criterion for resources allocation is based on administrative costs principle.

**2. Reactive relationship of IT to business strategy.** According the approach, enterprise recognizes importance of IT that increases sense that IT can contribute to implementation of chosen business strategy. Therefore, development and design of IS takes place by taking into account specific strategic context. This is reactive approach because chosen strategy has impact on design of IS but not vice versa.

**3. Interrelationship between IT and business strategy.** According the approach, development and modification of IS is in constant interrelationship with strategic context. Thus, modifications in business strategy initiate adequate changes in IS. The approach reflects two-way interrelationship, where basic criterion for resource allocation is based on principle of business investments.

Obviously, IT has great potential not only in support, but in formulation of business strategy. Although great number of enterprises belongs to first and second category, it is clear that many successful enterprises go towards third category.

### III. THE STRATEGIC ROLE OF IT IN ENTERPRISE BUSINESS

We evaluate strategic role of IT from aspect of internal business activities and from aspect of competitive environment in which enterprise operates. Enterprise should determine information intensity of its business activities and the role of IT in information transformation to knowledge. In addition, enterprise should analyse competitive forces and formulate strategy to control the forces by IT.

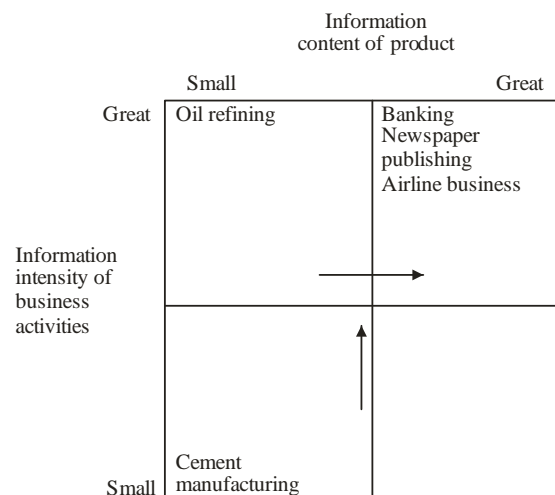
Porter (1985) have categorized all business activities (value activities) into five basic categories: 1. inbound logistic (e.g. materials management and warehousing), 2. internal operation (e.g. manufacturing and assembly), 3. outbound logistic (e.g. order processing, and product delivery), 4. marketing and sales (e.g. advertisement and promotion), 5. customer service (e.g. service and repair of products). Support to basic (primary) activities gives auxiliary activities including: organization (general management, accounting), human resource management, technology development, procurement.

IT transforms the way of business activities achievement and nature of relationship between them. Also, IT creates new relations between activities and enterprise now can better coordinate its actions with actions of customers and suppliers.

Every business activity and product have physical and information component. Physical component relates to achievement of activity, while information component provides needed information for the activity management. Information component of product gets more and more importance and relates to product characteristics and way of its use. IT enables to get more information with physical product. Some products

process information in their usual operation (e.g. washing-machine, car, mobile telephone, etc.). IT improves performance of products and facilitates use of information component of product. Therefore, information component of business activities and products is more and more supported by IT, so conversion of data and information to knowledge is facilitated.

Nevertheless that information content in products and activities is more and more intensive, role of IT is different in different industries. Relation between information content of product and information intensity of business activities is presented on fig. 3. It should stress that trend to more intensive information content is inspired by cost reduction and increasing of new IT abilities. (Porter & Millar, 1985)



**Fig. 3. The role of IT in specific industries**

IT has strategic role in certain industry if there are: **a) potentially great information intensity of enterprise business activities** (great number of customers and suppliers, products that require great quantity of information in sale, great number of phases in manufacturing process, product composed of great number of parts, great time period between order initiation and product delivery); **b) potentially great information intensity of enterprise products** (product that mainly provides information, product whose operations encompass considerable information processing, product requiring very high costs of customer training, product that has many alternative uses).

Quite another context for evaluation of strategic role of IT gives enterprise competitive environment. Knowledge management with support of IT enables enterprise to adapt to continual changes of the environment, to subsist in the environment and to compete with rivals.

Competitive forces from environment that influence on enterprise are: power of customers, power of suppliers, threat of new competitors, threat of substitute products and rivalry of present competitors. From long-range aspect, enterprise can subsist and gain profit if formulates strategy to successfully oppose to the forces determining structure of an industry and basis of competition in it.

IT can impact on all five competitive forces and obtain competitive advantage to enterprise which is able to constructively use it. Competitive strategies that enable enterprise to counteract to the forces are:

- Low costs strategy (e.g. costs reduction of key business activities by support of IT and gaining advantage in regard to competitors),
- Strategy of differentiation and innovation (e.g. great investments in innovative IT use which create barriers for entry of new competitors on market, differentiation of product by creation of original package design with support of IT as response to emergence of substitute products),
- Strategy of competitive scope increasing (e.g. use of internet for gaining of new market segments)

Therefore, it is important for enterprise to determine whether it can gain competitive advantage by IT. If answer to following questions is affirmative, then IT has strategic role in enterprise: Can IT create barriers for entry of new competitors? Can IT create switching costs related to suppliers? Can IT change basis of competition (e.g. reduction of costs and increasing of product differentiation)? Can IT change balance of power between customers and suppliers? Can IT generate new products?

#### IV. THE ROLE OF IT IN ENTERPRISE KNOWLEDGE MANAGEMENT

Knowledge management can be defined as systematic, explicit and methodical creation, retention and use of knowledge in order to maximize enterprise effectiveness and revenue from assets contained in knowledge. Primary focus of knowledge management is use of information technologies and tools, business

processes, best practices and culture in order to develop and share knowledge in organization and to connect knowledge owners to people who do not possess it. Finally, use of relevant knowledge to improve performance of organization is essence of knowledge management.

Among the other advantages, knowledge management enables organizations to develop processes supporting solution of similar business problems permanently occurring. Simply, on basis of known practices in solution of past problems, similar problems will be solved in the future. Intellectual capital offers to organization unique competitive advantage whereas it can not be copied easily by the other organizations. The recent study (Oseledchik et al. 2018) quotes that if companies use huge wealth of knowledge, skills and best practices which possess it will enable great financial benefits, acceleration of business processes, better satisfaction of customer needs and increase of business opportunities of organizations.

Knowledge creation, retention and sharing inside and between various communities and groups of users require coordinative management and exchange of knowledge. IT provides channels for flow of the knowledge and means for processing and conversion of knowledge from one form to another. Therefore, knowledge management IT should enable:

- knowledge creation;
- defining, storage, categorization, indexing and joining of digital objects related to some knowledge area;
- search of relevant content;
- presentation of content with enough flexibility of expression in order that knowledge be applicable in different contexts.

Market of knowledge management IT offers many products and “portal” solutions for main functions and activities of knowledge management. Many companies implement knowledge management IT by buying readymade solutions and account that buying of some technology will obtain return on investment. Many researches (Iskandar et al. 2017) show that most important role in knowledge management plays following ITs: intranet, systems for document management, data warehouses and data mining, web search engines, push technologies and intelligent agents, groupware and workflow, help-desk applications. In order to choose adequate technologies, specific role of any of them must be analysed. We present brief review of the most important ITs and its roles in knowledge management:

- **Systems for document management** are warehouses of important documents of enterprise and worth tools for creation and processing of complex documents. Content of documents along with principles of its organization makes explicit intellectual assets of enterprise.
- **Data warehouse** is hardware and software platform with integral and cleaned operational data of improved quality for support of decision making processes in organization. **Data mining** is technology which is used to extract and analyse useful information from great database, such as data warehouse.
- **Enterprise information portal** is web application enabling company to make available stored information to internal and external users. Portal obtains to internal and external users unique gateway to personalized information needed for decision making.
- **Web search engines** improve rapidity and accuracy of information search through nature query languages, information filtering or creation of abstracts. Push technologies and agents facilitate tracking of some types of knowledge, so users do not have to learn complex syntax of searching.
- **Groupware** improves exchange of tacit knowledge allowing formal and ad hoc conversation between employees in spite of time, spatial and social barriers.
- **Workflow** applications enable users to codify formalized knowledge transfer processes and to manage flow of information compatible with flow of work processes in enterprises.
- **Help-desk** technology is used in many organizations as mean of response to requirements of internal and external customers. Accumulated knowledge in using of such systems has more extensive application in fast design and improvement of products and services.
- **Knowledge mapping** is technology playing role of yellow pages for transfer of best business practices to interested users.
- **Training systems and simulation software** enable employees to acquire knowledge and support conversion of explicit knowledge to tacit knowledge.

Besides great expectations, individual technology can not solve all problems of knowledge management in enterprise. Thus mix of several technologies should be considered. It is important to understand how creative development of existed technologies to connect with new IT products entering on market.

The technologies should be integrated under umbrella of formal strategy exceeding short range requirements and specific models of suppliers of individual knowledge management technology. The strategy must be shaped according to organizational structure and culture. Standards of knowledge exchange, sharing and modelling and standards for measurement of knowledge work will be critical in that effort.

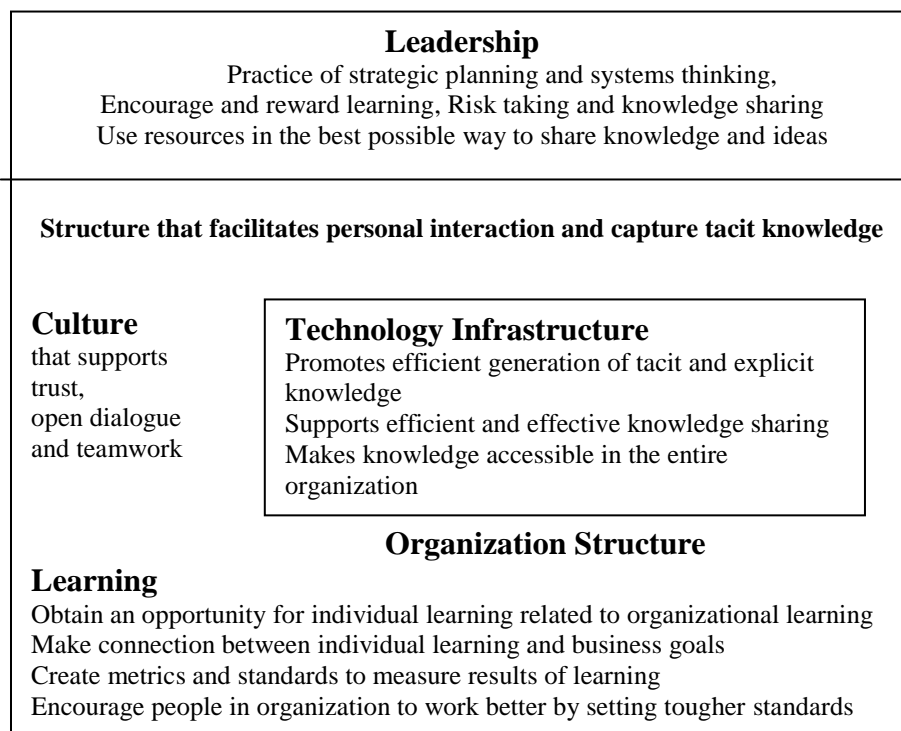


**V. THE ROLE OF ORGANIZATIONAL FACTORS IN KNOWLEDGE MANAGEMENT**

As we can see, enterprises adopt more and more technologies in order to maximize benefits from knowledge management. However recent global analyses of investment in knowledge management IT show that its success and return is not guaranteed (Tavera Romero et al. 2021). If importance of IT is overrated without including the other factors (business strategy with leadership, organizational structure, culture and learning) knowledge management does not give expected effects. In order to knowledge management projects would be successful, enterprises must comprehend business practice and culture and make necessary organizational changes. Key factor of greater return on investment in knowledge management IT is choice of right technology for given business and organizational context and effective use of knowledge by application of the technology.

Besides IT, organizational, non-technical factors necessary for successful implementation of business initiatives related to knowledge management are shown on fig. 4: business strategy, leadership, organizational structure, culture and learning. (Khabarov & Volegzhanina, 2019)

Leadership is directed to strategic planning and systemic thinking, extracting the most possible benefits from resources, nurture of culture encouraging open dialogue and team learning. Finally, leadership is directed to stimulation and compensation for taking risk, learning and knowledge sharing. Organization should have structure facilitating personal interaction and supporting community of practice in gaining of tacit and explicit knowledge. Finally, organization should enable individual learning and connect it with business performances. Such organization should develop standards for measurement of learning results and encourage employees to work better by setting of rigorous and clear goals. (Liang & Liu, 2018)



**Fig. 4. Organizational factors of knowledge management**

Learning and knowledge management have been realising in very dynamic organizational context, therefore organizations should be viewed and understood as dynamic social systems. In addition, organizations are continually facing with more complex and dynamic global markets. Traditional approaches to gaining competitive advantage have limited influence. Traditional competitive strategies usually formulate plans based on linear models that do not describe complexity and dynamic of today business environment.

As we already stressed, key factor of greater return on investment in knowledge management projects is choice of appropriate information technologies for given business and organizational context and effective knowledge management by using the technologies. Knowledge management information technologies are organized around five activities (identification, evaluation, codification, storage and sharing of knowledge) to achieve six basic aims: know what, know where, know when, know who and know why. (Loon, 2019)

Basic characteristic of organizations as social systems is that its effectiveness is not considered only through business activities and performance, but through combination of business activities and learning. Information technologies should be coordinated with knowledge flow in an organization, knowledge context

and critical actions supporting IT investments. As we could see, leadership, organization, technology and learning are four main pillars of knowledge management, and organizational and managerial factors are becoming inevitable in IT applications and scope definition of the technologies. The scope is defined as combination of events balancing technologies, knowledge flow, knowledge context and critical actions supporting IT investments.

## VI. CONCLUSION

Many organizations try to improve business performances by undertaking knowledge management projects. Although organizations undertaking knowledge management projects tend to increase efficiency, effectiveness and innovativeness, common accepted knowledge management principles have not yet developed. Great problem in knowledge management is lack of practical engagement focused on concrete initiatives and programs. Merely, there are great visions, but less practicality. In many organizations, knowledge management concept is identified with information management, because it is related to technological solutions, such as intranet and databases. With such narrow focus, organizational efforts in knowledge management and expected effects will also be limited. When management of enterprise evaluate strategic role of IT, it should consider contribution of the IT to achievement of primary business activities which are knowledge and information intensive and influence of the IT on competitive forces. Full effect of knowledge management supported by IT is got when leadership, culture and organizational structure encouraging learning, knowledge sharing and exchange are taken into account.

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