

## APPROACHING BUSINESS SYSTEMS THROUGH THE LENS OF KNOWLEDGE MANAGEMENT TECHNOLOGIES

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**Abstract.** Any business system is designed to achieve the business strategy. It can be reached by connecting all an organization's parts and processes to work together effectively and efficiently. Knowledge management technologies can facilitate it to a great extent. These technologies are essential for contemporary organizations to become and grow successfully in the marketplace. However, the level at which organization applies these technologies varies. The approach on how to analyze business systems from knowledge management technologies perspective is essential because of the rapid change of the business environment in which effective and efficient business strategy seeks to be implemented. Knowledge management technologies are enablers to simplify knowledge identification; acquisition of knowledge; knowledge development; knowledge sharing and dissemination; use of knowledge; knowledge preservation, and others. There are endless cycles of information transfer. Knowledge management processes ensure the smooth transfer and use of knowledge in organizations. The paper aims to present the approach to valuing business systems from knowledge management technologies perspective. As the term knowledge management technologies is complex and confusing, first based on a literature review, the analysis of how to classify those technologies is performed. The business system is analyzed from a socio-technical system perspective and approach to valuing it is presented. The paper contributes with these findings: 1) provides the results of scientific analysis on approaches how to classify knowledge management technologies, 2) determines an approach to valuing business systems from knowledge management technologies perspective consisting of five-level maturity construct. Based on the approach in the future, the evaluation methodology will be constructed. As the paper provides the theoretical background of the business system evaluation strategy from knowledge management technologies perspective, the future work will incorporate the development of the method for practical applications.

**Keywords:** business systems, technologies, knowledge management, evaluation, criteria.

## INTRODUCTION

Business systems can be seen and analyzed from different perspectives. The perspective taken on it depends on the field of science, level of abstraction, others point of view. Despite the huge variety of approaches to the business systems, the common agreement among scientist and practicum is that any business system is designed to achieve the business strategy and it can be reached by connecting all an organization's parts and processes to work together effectively and efficiently. Knowledge management technologies can facilitate it to a great extent. However, by valuing business performance, the role of knowledge management technologies must be considered as well. With the aim of this paper, a business system is interpreted as an abstraction of a company from a socio-technic system perspective, which consists of technology, people, resources and processes (Töhönen et al., 2020) with the extension to business strategy (Malhotra, 2005).

Knowledge management (KM) is a broad and complex term. Although KM has a lot of advantages and disadvantages at the same time, still organizations demonstrate a growing interest in KM since they have recognized that effective application of knowledge assets and resources make them more innovative, enable them to meet customers' demands and to help them survive in an ever-growing competitive economy (Hashemi et al., 2018). However, approaches proposed decades ago in the scientific literature are no longer satisfied with today's organizations, because of significant changes, ever-increasing competition, a lack of skilled knowledge workers and other challenges inherent in today's economy that are forcing a change in attitudes towards KM (North & Kumta, 2018). In contemporary organization KM is analyzed in various deeper sections by assessing individual activities, processes, influences and performance for different organizations by identifying specific spheres of influence depending on the type of organization and activities (Alrubaiee, L., Alzubi, H. M., Hanandeh, R., & Ali, 2015).

KM today is integral to information technologies. New technologies are accelerating KM processes and increasing their power. This interface shapes a new approach to KM in an organization. It amends a paradigm of KM: "Organizations that want to make knowledge transfer and communication, both external and internal, as smooth, and convenient as possible use technology because technology is the way the organization connects and helps to reach great to a good performance of the business system. Since KM technologies are always used in the context of KM initiatives, if those initiatives support a knowledge strategy, then the technologies have strategic value" (Saito et al., 2007).

Technologies for KM or knowledge management technologies (KMT) are a broad category of research issues on KM. Therefore, technologies and applications of KM are attracting much attention and

efforts, both academic and practical (Hashemi et al., 2018; Liao, 2003; Saito et al., 2007). KMT are presented from various aspects. However, there is no comprehensive framework that has a consolidated approach covering all the factors in KM technologies' classification (Hashemi et al., 2018). Although there are several attempts to provide evaluation strategy of KMT (Centobelli et al., 2017), still theoretical basis of business system value evaluation in the perspective of KMT is scattered, and even more evaluation practices are missing. This paper takes a goal and presents an approach to value business systems from knowledge management technologies perspective. The paper provides the theoretical background of the business system evaluation strategy from knowledge management technologies perspective, and the future work will incorporate the development of the method for practical applications.

**The purpose of the scholarly analysis** – to provide the results of scientific analysis on approaches on how to classify knowledge management technologies and represents the approach to valuing business systems from knowledge management technologies perspective.

**Research object** – knowledge management technologies within the business system.

**Applied methods** – scientific literature analysis.

The remainder of this paper is organized as follows: Section I reviews the concepts of business systems and knowledge management; knowledge management technologies for business systems management; Section II describes methodological approach how to value business systems from knowledge management technologies perspective and determines five-level concept for classification; Section III presents conclusions.

## I. BACKGROUND

### 1.1 CONCEPTS OF BUSINESS SYSTEMS AND KNOWLEDGE MANAGEMENT

There are different approaches to the business system. In business terminology, a *business system* refers to the value-added chain, which describes the value-added process, meaning the supply of goods and services. A business can span one or several business systems<sup>1</sup>. The perspective taken on the business system depends on the field of science, e.g. economic, psychology, system engineering, level of abstraction, e.g. system, subsystem, or another viewpoint. For example, (Witt et al., 2018) defines it from an economic perspective and distinguish all business systems into nine types: Highly Coordinated, Coordinated Market, Liberal Market, European Peripheral, Advanced Emerging, Advanced City, Arab Oil-Based, Emerging, and Socialist Economies. From the systems engineering point of view, the definition

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<sup>1</sup> <https://sourcemaking.com/uml/modeling-business-systems/business-processes-and-business-systems>

is given by (Souchkov, 2015): “A business system consists of several components and interactions between them. It also involves various interactions with its supersystem. Key system and supersystem components and interactions can be presented by a business model which provides a unified framework to model a large diversity of business systems, value creation chains and network. A business system deploys some business processes and activities which add value after each activity in each business process. Today most business systems operate based on business processes which clearly define various aspects of a business system functioning and behaviour. A modern business system possesses a well-defined structure and well-described relationships between its internal parts and their external system: a supersystem”. Others define the business system as an abstraction for a focal company enclosing a specific IT system (Töhönen et al., 2020). A business system can be seen as well as a socio-technical system, consisting of technology, people, resources and processes (Töhönen et al., 2020). The latter approach enables to analyze the business system in a structured manner by taking into account main components of the system because according to (Souchkov, 2015) “business systems operate with people and therefore they have different principles of evolution rather than technical systems”. Any business system is designed to connect all of an organization’s intricate parts and interrelated steps to work together for the achievement of the business strategy (Hashemi et al., 2018). The competitive necessities for companies today are to develop capabilities that are deeply embedded into functions, operations and business decisions (North & Kumta, 2018). In this paper business system is interpreted as an abstraction of a company as a socio-technic system, which consists of technology, people, resources and processes (Töhönen et al., 2020) with the extension to business strategy to incorporate in KM strategy-pull model according to (Malhotra, 2005).

Organizations demonstrate a growing interest in KM since they have recognized that effective application of knowledge assets and resources make them more innovative, enable them to meet customers’ demands and to help them survive in an ever-growing competitive economy (Hashemi et al., 2018). All businesses have access to an extensive pool of knowledge - whether this is their understanding of customers' needs and the business environment or the skills and experience of staff. The way a business gathers, shares and exploits this knowledge can be central to its ability to thrive. It does not just apply to huge multinational companies. Knowledge management can benefit everyone from a local newsstand to a manufacturing firm<sup>2</sup>. KM is not a new topic to organizations (Gao et al., 2003). However, approaches proposed decades ago in the scientific literature (Liao, 2003; Rao, 2005) are no longer satisfied with

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<sup>2</sup> <https://www.infoentrepreneurs.org/en/guides/importance-of-knowledge-to-a-growing-business/>

today's organizations, because of significant changes, ever-increasing competition, a lack of skilled knowledge workers and other challenges inherent in today's economy that are forcing a change in attitudes towards knowledge management (North & Kumta, 2018). In contemporary organization knowledge management is analyzed in various deeper sections by assessing individual activities, processes, influences and performance for different organizations by identifying specific spheres of influence depending on the type of organization and activities (Alrubaiee, L., Alzubi, H. M., Hanandeh, R., & Ali, 2015). Moreover, (Saito et al., 2007) found out that there are different approaches to KM strategy: KM strategy as an approach to KM (reflects the diversity of perspectives presented in the field and the lack of consensual models), KM strategy as knowledge strategy (links KM to business strategy), KM strategy as KM implementation strategy (applies mainly to the executives and managers responsible for the KM function or KM programs in an organization). The latter approach helps to identify the establishment of evaluation criteria of KMT.

Knowledge management today is integral to information technologies. New technologies are accelerating knowledge management processes and increasing their power. This interface shapes a new approach to knowledge management in an organization and amends a paradigm of knowledge management. Knowledge management (KM) may simply be defined as doing what is needed to get the most out of knowledge resources (North & Kumta, 2018). (Sabherwal et al., 2014) defines KM as performing the activities involved in discovering, capturing, sharing, and applying knowledge to enhance, in a cost-effective fashion, the impact of knowledge on the unit's goal achievement. The review of KM processes shows that there are as many frameworks of KM life cycles or processes as authors (Shongwe, 2016). Organizations still demonstrate a growing interest in KM since they have recognized that practical application of knowledge assets and resources make them more innovative, enable them to meet customers' demands and to help them survive in an ever-growing competitive economy (Hashemi et al., 2018). (Malhotra, 2005) researched and concluded with two approaches how KM is approached within organization: technology-push or strategy-pull model of KM. The author concludes that, in contrary to the technology-push model of KM, strategy-pull model business performance not as the residual but as the prime driver of information utilization as well as IT-deployment. The key emphasis is on strategic execution for driving selection and adaptation of processes and carefully selected technologies (Malhotra, 2005). Therefore, the methodology valuing business systems from knowledge management technologies perspective takes an important place.

## 1.2 APPROACHES TO KNOWLEDGE MANAGEMENT TECHNOLOGIES

Technologies that can support KM or KM technologies are presented from various aspects. However, there is no comprehensive framework that has a consolidated approach covering all the factors in KM technologies' classification (Hashemi et al., 2018). Table 1 provides systemized approaches to KMT.

Table 1. Approaches to knowledge management technologies

Approach	Authors
From the viewpoint of KM processes	(Antonova et al., 2006; Sabherwal et al., 2014)(Hashemi et al., 2018)
From the viewpoint of KM system architecture	(Maier, 2007)
From their relationship with KM strategies	(Saito et al., 2007)
From the viewpoint of types of knowledge	(Maier, 2007)
From the viewpoint of the functionality of KMS	(Maier, 2007)
Supporting KM/Managerial KMT	(Centobelli et al., 2017; North & Kumta, 2018; Rao, 2005)

The usual approach is to associate KMT with knowledge management processes, e.g. creation, storage and retrieval, transfer, and application (Antonova et al., 2006); or socialization, externalization, combination, and internalization, but the processes identified vary widely, hindering a more general understanding. Knowledge processes are too complex and context-dependent to be used as a general criterion for classifying KM technologies (Saito et al., 2007). Although according to (Saito et al., 2007) the analysis of existing approaches to identify, describe, and organize KM technologies reveals that the usual approach relating them to knowledge processes is problematic, this approach is helpful to provide some useful criteria for distinguishing and explaining them in the view of the business system. Therefore, the analysis of scientific literature would give some insights about the most relevant KM processes. Technology can be seen both as enabler (supports the diffusion and implementation of innovative organizational models, such as the learning organization, allowing faster and more efficient communication and information flows, introduce elements of process optimization and efficiency) and as a mediator (the use of KM technology systems removes information barriers and gives a sense of greater freedom of access to it (Yiu & Law, 2016). Moreover, web evolution (Król, 2020; Patel, 2013) provides some insights and describes opportunities for knowledge management context as well.

(Rao, 2005) classifies all KMT into three families based on their core functional focus: content, collaboration, and computation. It is noticed that these three categories, to some extent, can be represented

by the repository (content), sharing (collaboration), discovery (computation). The meta-analysis of the newest literature reviews (Antonova et al., 2006; Hashemi et al., 2018; Liao, 2003; Shongwe, 2016) shows that most frequent categories applied within KM processes are: Sharing (relevance 98%), Creation (relevance 79%), application (relevance 79%) and Storing (relevance 61 %).

(Maier, 2007) differentiated all the classifications of KMT into two categories: a) Market view. These classifications try to cover either technologies, tools and systems that potentially support KM (wide view) or they cover the functionality of knowledge management systems (narrow view); b) Theoretical view. These classifications are based on existing models describing types of knowledge (abstract view) or organizational learning processes or tasks, respectively (concrete view) that could potentially be supported by ICT in general or KMS.

(Centobelli et al., 2017) divides KMSs into two categories: knowledge management tools (KM-Tools) and knowledge management practices (KM-Practices) based on work of (Sabherwal et al., 2014): ‘The paper identifies three groups of SMEs that seem to point out the stages of the process of adoption of KMSs: Introduction, SMEs that deal with the process of knowledge management exploiting practices and tools that are already known; Growth, SMEs that adopt specialist practices of knowledge management acquiring new organizational and managerial competence in the field of knowledge management; Maturity, SMEs that invest in new technology and that acquire new technological competence in the field of knowledge management.’ The authors in their continuing research provide not only the methodology for evaluating of the degree of adoption of KMSs by SMEs but (Centobelli et al., 2019) presents the model to assess the efficiency and effectiveness of knowledge management systems (KMSs) adopted by small and medium enterprises (SMEs).

The most prominent approach was proposed by (Saito et al., 2007) with the focus on strategy-based approached and authors emphasize a significant contribution from this approach: the distinction between component technologies and systems. The notion of integration is a characteristic of technology in general: components are integrated into systems, which are integrated into even larger systems. Component technologies are the building blocks of KM systems; KM applications are the generic KM systems, and business applications are the business-driven KM systems. (Figure 1.)

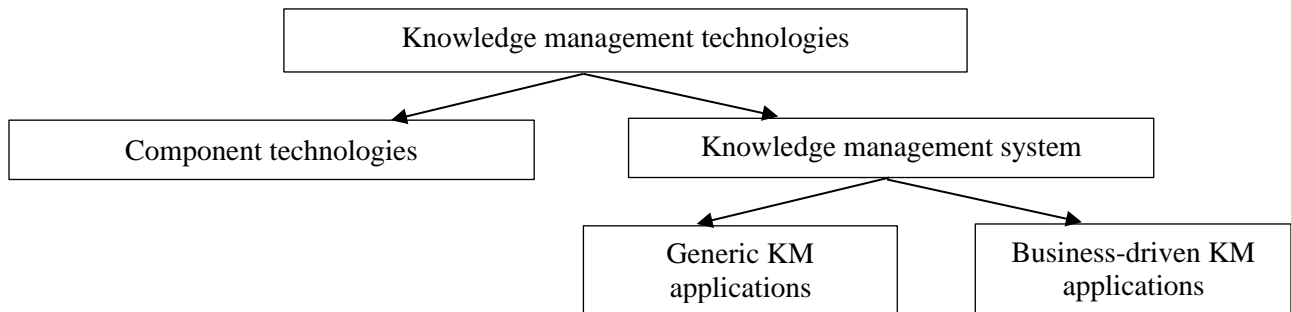


Fig. 1. (Saito et al., 2007) approach to classify KMT

KMT highly depends on technologies trends<sup>3</sup> which will put "people at the centre of your technology strategy highlights one of the most important aspects of technology — how it impacts customers, employees, business partners, society or other key constituencies. Arguably all actions of the organization can be attributed to how it impacts these individuals and groups either directly or indirectly. It is a people-centric approach."

### 1.3 VALUING BUSINESS SYSTEMS FROM KNOWLEDGE MANAGEMENT TECHNOLOGIES PERSPECTIVE

Based on findings from a recent scientific literature review, the approach to valuing business systems from knowledge management technologies perspective can be represented. As it was already stated a business system in the paper is defined as a socio-technical system. Such a system according to processes (Töhönen et al., 2020) consists of technology, people, resources and processes. For each of these components, specific metrics can be assigned, e.g. technology metrics, process metrics, non-human resources metrics, human resources metrics. So, in a socio-technical system, all the parts are interacting and forming both an ability and culture for the business system to thrive, i.e. it depends on these factors. As KMT is a collection of technologies applicable to foster the performance of the business system, the approach on how to reveal the state "as-is" of KMT in a specific business system is crucial. There were several attempts by researchers providing frameworks valuing business systems (North & Kumta, 2018; Rao, 2005), but the still theoretical basis of business system value evaluation in the perspective of KMT is scattered, and even more evaluation practices are missing.

Starting from the definition of knowledge management technologies provided by (Sabherwal et al., 2014), (Saito et al., 2007) and (Centobelli et al., 2017) the definition of KMT includes knowledge

<sup>3</sup> <https://www.gartner.com/en/newsroom/press-releases/2019-10-21-gartner-identifies-the-top-10-strategic-technology-trends-for-2020>



management practices (KM-Practices according to (Centobelli et al., 2017) or KM mechanisms according to (Sabherwal et al., 2014)), defined as the set of methods and techniques to support the organizational processes of knowledge creation (discovery), storage (repositories), transfer (dissemination), sharing (collaboration); and knowledge management tools (KM-Tools), namely the specific IT-based systems or components according to (Saito et al., 2007) supporting KM- Practices (Fig. 2). This definition is more comprehensive and includes three categories of KMT: Component technologies which are the building blocks of KM systems; KM applications are the generic KM systems; and business applications are the business-driven KM systems, and any of the group can support business performance in multiple ways, can comprise more than one of possible KM strategies. As the general aim of KMT is to support KM strategy, and KM strategy – to support business strategy, the processing of main KM strategies (knowledge discovery, storage (repositories), transfer (dissemination), sharing (collaboration)) must be considered within the business system at different levels: individual, process and organization.

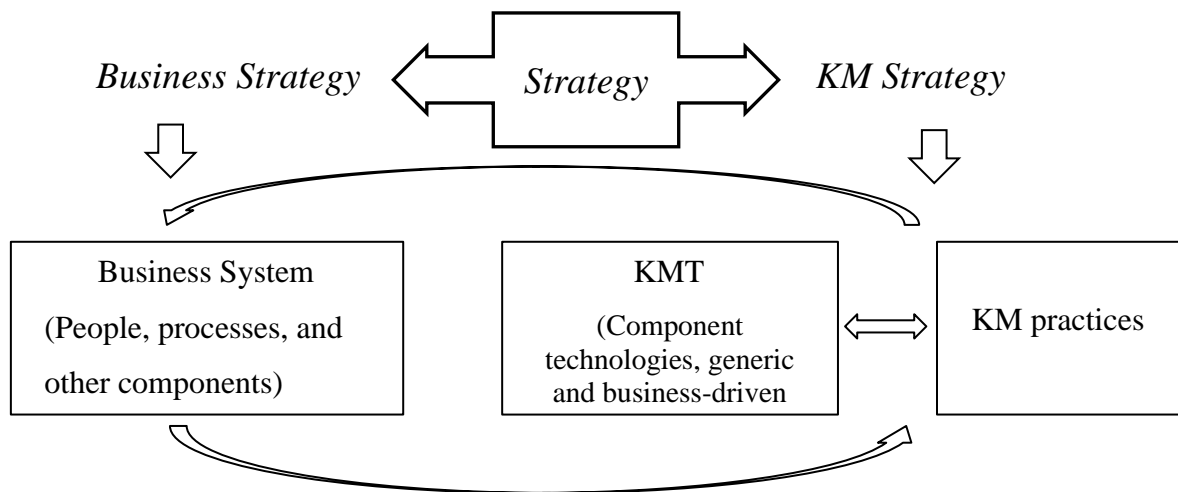


Fig. 2. Position of KMT from a strategy-pull model of KM perspective

An approach on how to value the business system from KMT perspective is based on analysis of its maturity in respect of KMT functionalities to business strategy and KM strategy. On the other hand, the technology functionalities can be conceptualized at a high level into four groups and be represented as collaboration technologies, discovery technologies, dissemination technologies and repository technologies (Figure 3). So, any of the three groups of KMT (Figure 2) – component technologies, general systems and/or business-driven systems can fulfil any of these functionalities. The maturity level depends on business system strategy and KM strategy, which states the requirements for up to date infrastructure

and KM technologies (Figure 3). The complexity of KMT highly depends on the size of the business system, and the context business system is taking place.

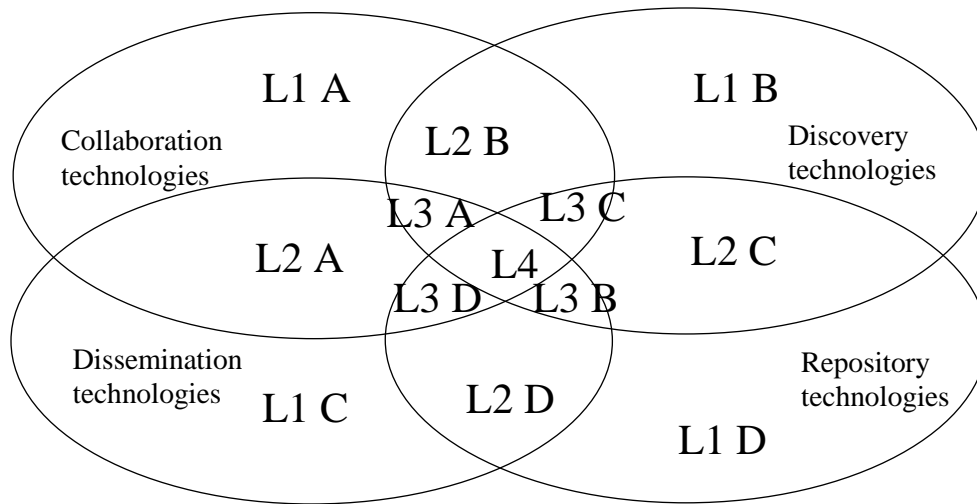


Fig. 3. An Approach to value a business system from KMT perspective

Next, the maturity levels will be determined. Level 0 business systems use no digital KMT, although it applies any of KM practices, e.g. face-to-face meetings. It means people use traditional ones like paper documents, libraries, a co-located collaboration which is an unlikely situation and position for a contemporary business system. These business systems mainly apply component technologies or generic KM technologies which are context-independent.

The business system can be said to be at Level 1 of KMT if it uses not more than one group of digital technologies. It includes business systems that have just made the shift from non-digital to digital document management systems (Level 1 D, e.g., from book to e-book use in e-learning process) or the business systems which use basic email lists for knowledge networking (Level 1 C). These business systems usually apply component technologies or generic KM technologies which are context-independent. In some cases it can be applied and business-driven technologies, for example, technologies for finance management or accounting.

If a business system uses two groups of KMT (e.g. intersection Level 2 A or 2 D), it can be said to be at Level 2 of KM technological complexity. For instance, the business system started to use e-learning system, which on base is just database of files and include some technological functionalities for the dissemination of these files, but not new technologies are available, i.e. collaborative activities still take place mostly face-to-face, and there are no functions to discover knowledge (Level 2 D). One of the examples could be the basic version of the virtual learning environment (VLE) “Moodle”, which mainly

serves as a repository and helps to disseminate knowledge with digital technologies.

The business system which uses three groups of KMT can be said to be at Level 3 of KM technological complexity. Most of the larger business systems not directly working in the data-driven IT context could be profiled at Level 3: they use a wide range of technologies for knowledge management and invest in technology integration for using these technologies. An example could be the extended version of VLE "Moodle" with some technologies for collaboration, e.g. BigBlueButton<sup>4</sup> functionality opens great space for collaboration, dissemination and repository knowledge. The business systems, belonging to this area, usually applies context-dependent KM technologies or adapt general technologies to their needs.

A business system which uses all four families of KMT can be said to be at Level 4. Most of the large business systems working in the data-driven IT context are at Level 4. They provide not only a wide range of technologies to support business system strategy but ensure effective and efficient an integration of these technologies, change management, and capacity building for using these technologies. Table 2 provides a brief comparison of these five levels.

Table 2. Levels of business system maturity from KMT perspective

Level of maturity	Description	Examples
Level 0	No digital KMT are applied	No digital components technology applied
Level 1 (L1 A, B, C, D)	One group of KMT is applied	Messaging/email or content management
Level 2 (L2 A, B, C, D)	Two groups of KMT are applied	Database + content management
Level 3 (L3 A, B, C, D)	Three groups of KMT are applied	Database + content management + email
Level 4 (L4)	All groups of KMT are applied	Database + content management + email + Knowledge Discovery in Databases, etc.

## CONCLUSIONS

The main aim of any business system is to achieve the business strategy. A business strategy requires business systems components to be orchestrated and appropriately managed and is treated as a socio-technical system. In any of these activities, knowledge management plays an important role, and knowledge management technologies facilitate it to a great extent. The paper presents the approach on how to analyze business systems from knowledge management technologies perspective. The approach is based on five levels of business system maturity from KMT perspective. All knowledge management

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<sup>4</sup> <https://bigbluebutton.org/>

technologies are classified into three groups: component technologies, general technologies, and business-driven technologies. These technologies can facilitate any of KM strategies and practices which are categorized as follows: collaboration strategy, dissemination strategy, knowledge discovery strategy and knowledge storage strategy. The future work is to construct the evaluation methodology based on the proposed approach. As the paper provides the theoretical background of the business system evaluation strategy from knowledge management technologies perspective, the future work will incorporate the development of the method for practical applications.

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