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► **To cite this version:**

Piotr Domagala. Barriers and Challenges of Knowledge Management in a Gas Company. IFIP International Workshop on Artificial Intelligence for Knowledge Management (AI4KMES), Aug 2021, Montreal, QC, Canada. pp.63-74, 10.1007/978-3-030-96592-1_5. hal-04120817

HAL Id: hal-04120817

<https://inria.hal.science/hal-04120817v1>

Submitted on 7 Jun 2023

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Barriers and Challenges of Knowledge Management in a Gas Company

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Gas is a greener alternative to coal. It is used to heat houses as well as fuel for cars. The gas industry market is dominated by large companies, operating across countries and continents. It is constantly growing. Managing such a large companies is extremely complex due to the scale of operations, rapid development of technologies and a large number of employees who work remotely and are geographically dispersed. In the context of the increasingly common treatment of knowledge as one of an organization's key resources and growing number of data generated by business, Knowledge Management has received considerable attention in the energy sector, including gas sector because of its impact on their performance. It is not an easy task because of complexity of whole process.

The author points out the potential barriers to the development of Knowledge Management in a gas company according to carried research.

Keywords: Knowledge Management, Gas Company, Competitive Advantage.

1 Introduction

Caring about the environment is one of the foundations of sustainable development. Nowadays, our civilization struggles, among others, with the problem of air pollution. Gas replaces coal with less harmful gas as a heating fuel. Gas is also a very popular solution used in the automotive industry. Whole industry develops extremely fast as a consequence.

The gas market is dominated by large enterprises that operate across entire countries and continents. Managing such a large companies is very complex due to the scale of operations, rapid development of technologies and a large number of employees who work remotely and are geographically dispersed.

There is a huge challenge in terms of the aging workforce as a large number of employees near retirement will soon leave the industry, thus begetting a profound knowledge loss. Layoffs will also occur when businesses are not performing well [1].

The existing literature does not provide detailed insights into the challenges and strategies associated with knowledge retention. There is also a lack of research on the global perspective of knowledge retention activities of retiring employees.

The author presents impact of an ageing workforce on knowledge retention, barriers that significantly hinder the knowledge management process in a gas company and

gives examples of solutions to improve knowledge retention and, consequently, the entire knowledge management process.

In the first chapter, the author focuses on the essence of knowledge management success and its growing importance for business. In the second section elements of Knowledge Management process are identified. In the last section, the author indicates the problems and needs in KM area in the gas company according to the research.

2 Role of Knowledge Management in Business

2.1 Knowledge as a factor of successful development

Knowledge is the foundation of economic growth today. Producing goods and services with high added value is the key to improving economic performance and enhancing international competitiveness. Increasing efforts in this direction has become a fundamental challenge for enterprises.[2]

According to the theory of knowledge-based organizations, knowledge by itself does not create a competitive advantage, and it is achieved through its application and integration with the company's business processes [3].

Knowledge Management (KM) is, in part, an attempt of the best possible use of knowledge, which is available in organization, creation of new knowledge and growth of knowledge understands [4].

Knowledge should be regarded as one of the strategic resources of the company, on a par with human resources, financial resources and material resources (equipment) and needs to be managed in appropriate way. It leads to Knowledge Management evolution and dissemination of intelligent organization concept.




2.2 Knowledge Management Evolution

Dynamic changes in the environment force changes in KM strategy and philosophy. KM is no longer an extra work to do. It is helpful to do our work in a real time.

Changes in the approach to management and the ever-growing role of knowledge in organizations go hand in hand with changes in the approach to Knowledge Management.

The table below shows changes in the approach to Knowledge Management over the years.

Table 1. Knowledge Management evolution.

KM 1.0	KM 2.0	KM 3.0
		
<p align="center">Collecting techno-centric approach</p>	<p align="center">Sharing people-centric approach</p>	<p align="center">Using productivity-centric approach</p>
<ul style="list-style-type: none"> – traditional organizational – content/community approaches – command and control – “KM is an extra work” – Focused on collecting knowledge – „before it walked at the door” 	<ul style="list-style-type: none"> – enriched with social media and ecosystem wide co-creation – “KM is part of my work” – social “KM is a part of my work” – Focused on sharing knowledge by using web-enabled and Social Media tools 	<ul style="list-style-type: none"> – KM augmented with AI – practical & individual „KM is helping my to do my work” – Focused on using existing knowledge to help people get their job done

At the beginning KM was targeted on knowledge collecting and the main tool were Knowledge Management Systems. Whole process of knowledge management was treated as an extra work.

With the passage of time and the development of web 2.0 technologies and social media, the approach has changed. It started to focus on the social importance of knowledge sharing.

Nowadays, from technical point of view, collecting and sharing of knowledge is not a big deal. People generate huge amounts of data every day. The problem is how to choose the most valuable information to support our work, make it useful and let company achieve competitive advantage.

2.3 Intelligent Organization Concept

The author mentioned that knowledge treated as one of strategic resources needs to be managed in appropriate way what leads to dissemination of intelligent organization concept.

Intelligent organization is assumed that it is an organization bases its philosophy on Knowledge Management. This term has become so popular due to the rapid development of ICT technologies, dynamically changing economic environment and increased

market competitiveness. We can consider organization as intelligent when it is a learning organization with the ability to create, acquire knowledge, organize, share it and use it to increase efficiency and competitiveness on the global market [4].



Fig. 1. Intelligent organization concept.

As the author shows at the picture above, growing number of usable data, knowledge treated as a valuable resource for business and develop of Knowledge Management are engine of modern, intelligent organization.

3 Knowledge Management in a Gas Company

3.1 Aging workforce and Knowledge Retention in a Gas Company

Knowledge retention has become an important and inevitable activity in organizations these days due to demographic changes and the graying of employees. There is a serious threat to the organizations for knowledge loss when employees leave [6].

As Figure 2 depicts, oil, gas and mining companies reported approximately one-quarter (27%) workforce in the industry is age 55 of older, similar to many other industries. About one-fifth (17%) of HR professionals in oil, gas and mining companies said they were not aware that the proportion of older workers was increasing and that older workers were projected to make up approximately 26% of the labor force by the year 2022, compared with 21% in 2012 and 14% in 2002 [7]. Losing these workers means organizations lose the much-needed knowledge which is basis for their competitive advantage. The knowledge of these employees is of key importance, as it may lead to a decay of organizational memory when these employees leave, which in turn may reduce the company's ability to identify and use past knowledge for competitive advantage.

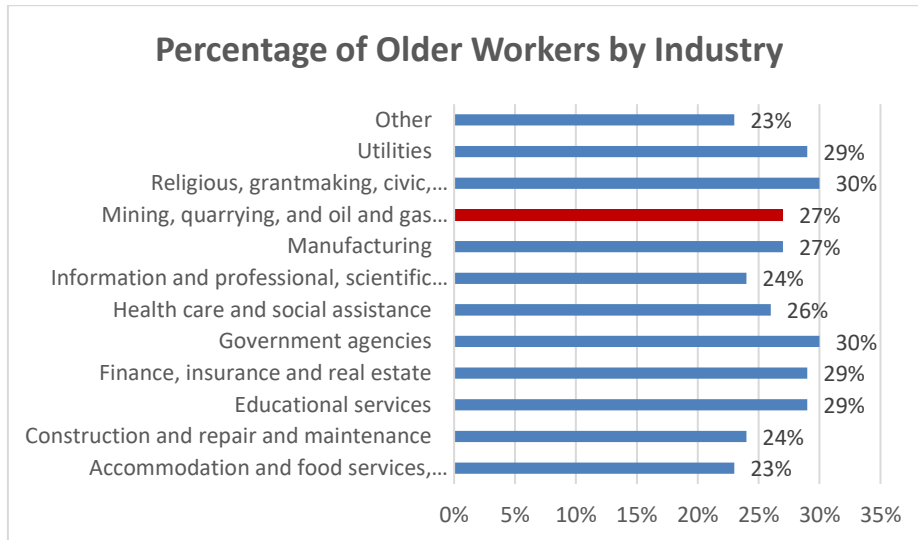


Fig. 2. Percentage of Older Workers by Industry

Source: Preparing for an Aging Workforce: Oil, Gas and Mining Industry Report (SHRM, 2015)

If we take into account factors such as the geographical dispersion of workers, their large number and the duties they perform, we can certainly conclude that they generate a significant amount of information and are in possession of knowledge of a very different nature. It is required to properly analyze the skills and capabilities of these employees, as they might be working on different job assignments during their careers and have a variety of expertise in different areas within the organization [8]. The comparison and analysis of known models of knowledge management processes allowed to propose four main problem areas related to the circulation of knowledge in the organization. These are:

- Identifying and locating knowledge,
- Knowledge retention,
- Knowledge transfer,
- Knowledge utilization.

The author describe them in the following sections of the chapter.

3.2 Identification of Critical Knowledge

Critical knowledge, is the unique types of knowledge and skills possessed by the employees whether it is knowledge related to management, technical areas or relationships [9]. Alavi and Leidner describe a knowledge taxonomy providing a possible context for considering the different knowledge types that the departing employees might possess [10]. The table 2 shows a breakdown of knowledge by object.

Table 2. Types of knowledge by object.

Type of knowledge	Description
Declarative/explicit knowledge (know about)	A codified, tangible/physical description of the knowledge in question to which a company has ownership rights. Factual knowledge, very close to the concept of information.
Procedural/tacit knowledge (know how)	Knowledge relates to skills, ability to produce.
Causal knowledge (know why)	Knowledge of cause and effect relationships and their consequences.
Conditional knowledge (know when)	Refers to knowing when to use declarative and procedural knowledge. It allows to allocate resources when using strategies. This in turn allows the strategies to become more effective.
Relational knowledge (know with)	Knowledge of other people, organizations who have knowledge that is useful to us and can help us to achieve our goals.

We can also divide knowledge according to its importance to the organization:

- technological key knowledge (knowledge of the main processes that generate knowledge for the customer),
- coordination key knowledge (knowledge of the resources, tools and solutions related to the management of knowledge in the organization),
- auxiliary knowledge (knowledge covering the supporting processes in the company),
- market knowledge (knowledge about the market segments in which the organization operates, customer needs and how to meet them).

Identification is a key activity for successful knowledge management processes. Many researchers point out the dangers of missing or inadequately identifying the knowledge of an organization and its environment. Hence, it is extremely important to organize it according to clearly defined criteria.

Identifying knowledge aims to identify not only the current, but also the target, postulated and ideal state of knowledge in a company. The difference between the current state and the desired state is the knowledge gap.

3.3 Knowledge Retention

Within the process of knowledge retention/gathering we can distinguish between activities aimed at: capturing, processing, storing, securing and protecting the organization's knowledge.

Identified and localized knowledge should be extracted to serve the objectives of the organization and its members. Its processing should enable access to the organization's knowledge resources in an accessible and understandable form for all stakeholders. The storage of knowledge will serve to preserve it within the organization for repeated use in the future, and its preservation and protection are intended to ensure that the knowledge is used in a manner consistent with the organization's goals and policies.

We consider the problem of knowledge accumulation in an organization from two aspects - the technological aspect (advanced ICT technology in the form of database systems, expert systems, knowledge bases/portals, etc.) and the human aspect (knowledge accumulation in people).

The former is accentuated in organizations focused on explicit knowledge, aiming to codify and document employee knowledge. In the second case, the emphasis is on the soft aspects, the absorption of knowledge and the learning of individuals.

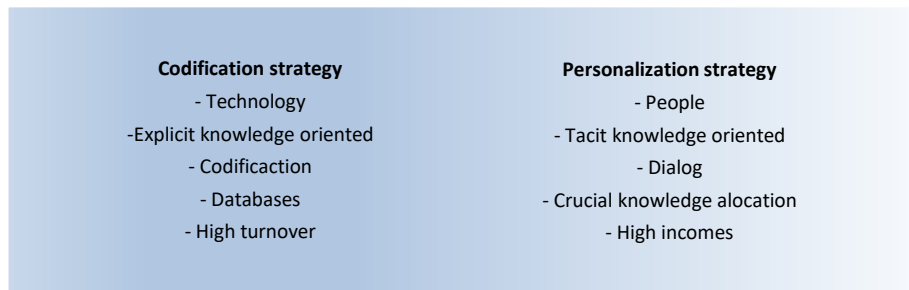


Fig. 3. Codification and personalization strategy.

The figure above summarizes the most significant differences in knowledge codification and personalization strategies.

Many experts wonder which knowledge management tools to use in the context of the strategies outlined above. The results of a study by J. Román Velázquez can be used for this purpose, the results of which are presented in the figure below [11].

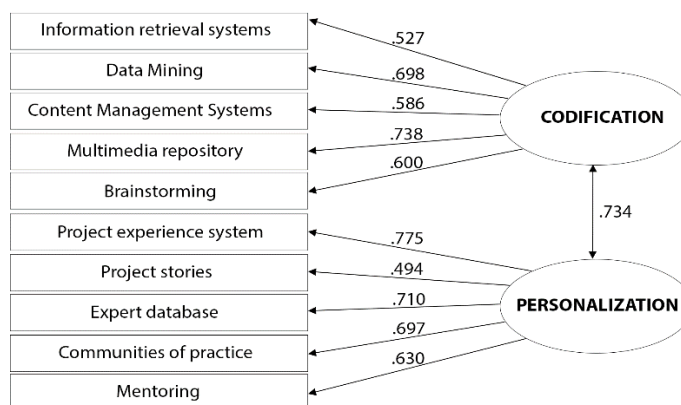


Fig. 4. Knowledge management strategies and the tools they use.

The diagram shows how different tools can be used due to the company's preferred Knowledge Management strategy.

3.4 Knowledge Transfer

The term knowledge transfer refers to activities, tools and conditions that enable the flow and sharing of knowledge within an organization.

The academic literature shows a dualism between the concepts of knowledge flow in organizations, which is often considered independently of the concept of knowledge sharing. These concepts are often equated with each other, but there are scientific indications that these concepts have different meanings [12]. Researchers point out that knowledge transfer is characterized by, among other things, an unambiguous purpose, unidirectional transfer and concentration and focus. In terms of the above characteristics, the scientific world agrees.

It is worth noting at this point the important role of the transformation model and the mutual transformation of explicit and tacit knowledge.

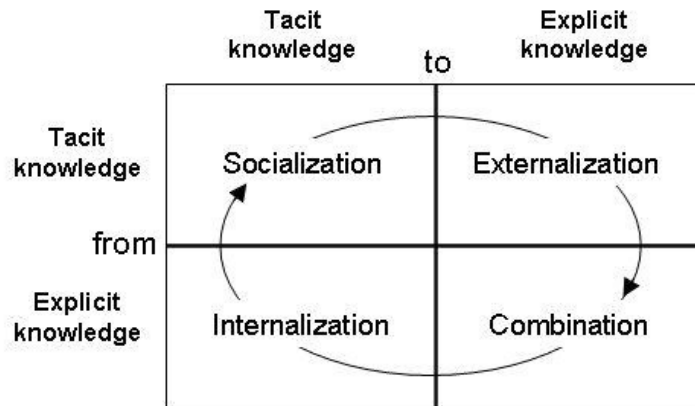


Fig. 5. Knowledge Transformation.

Nonaka assumed that knowledge growth is possible through the occurring relations of tacit and explicit knowledge [13]. Based on this assumption, he identified 4 types of transformation of knowledge types, which are shown in the diagram above.

Table 3 presents these relations/transformations in details.

Table 3. Relations in Knowledge Transformation.

Transformation	Description
Socialization	Tacit → Tacit The creation and transfer of tacit knowledge during face-to-face interactions between individuals. It is reflected in staff development methods such as on-the-job training or manager shadowing.

Combination	<p>Explicit → Explicit</p> <p>Creating new knowledge by reconfiguring existing explicit knowledge resources: sorting, adding, categorizing, giving new meanings.</p> <p>It is reflected in the form of artefacts: documentation, databases and data warehouses, publications, internal manuals, instructions.</p>
Externalization	<p>Tacit → Explicit</p> <p>Verbalizing tacit knowledge held, describing it using language, metaphors, models, action schemes, knowledge maps. It allows knowledge to be extracted from the individual while preserving it in a form that can be used later.</p>
Internalization	<p>Explicit → Tacit</p> <p>Internalization through the process of learning enriches the individual knowledge of employees with knowledge assimilated from explicit knowledge carriers.</p> <p>This is equivalent to the concept of "learning by doing".</p>

The concept has found wide recognition in the Knowledge Management world. The model created has become the basis for designing many Knowledge Management solutions and tools.

3.5 Knowledge Utilization

Putting knowledge into practice is a much more difficult activity than other knowledge management processes. Repeated observations by researchers (J. Pfeiffer and R.I. Sutton) support the finding that people understand the nature of the problem, know what needs to be done to improve company performance, but do not do it. Moreover, research shows that the success of the implementation of these measures does not depend on the introduction of new, hitherto unknown methods, but precisely on the ability to make practical use of the knowledge that already exists in the organization [14].

Using knowledge in practice it is not an easy task. In the next part of the publication, the author points out the most common causes of Knowledge Management failures, barriers and challenges in gas company.

4 Knowledge Management Barriers in Gas Company

Knowledge management processes are ancillary, supportive to the main business processes in organizations. Their contribution to reducing costs, increasing quality, shortening the time of execution of critical processes should be measurable and perceivable. Otherwise, all knowledge management efforts in an organization lose their justification.

The processes of identifying and locating knowledge, collecting and transferring it, presented by the author, should focus as much as possible on using the knowledge that is the subject of these processes, so that it becomes possible to quickly and efficiently apply the accumulated knowledge in practice to solve problem situations.

According to the theory of knowledge-based organizations, knowledge by itself does not create competitive advantage, it is achieved through its application and integration into companies' business processes [15].

The author presents what are the most common reasons for the failure of the knowledge management process in a gas company.

At the beginning the author described four main areas of problems in Knowledge Management (identification, retention, transferring and knowledge utilization). Then, the author use available research findings [15] outlining common barriers to knowledge management in a gas industry company and then conducted in-depth interviews with employees of a company in the same industry in Poland.

Among those surveyed were employees from: executives (1), HR (2), ICT (3), sales (4), planning & investment (5), real estate (6), finance (7), law (8), Field staff (9). In this way, the barriers for the company under study are identified.

For the purposes of the study, barriers were grouped thematically in areas: managing knowledge processes, people, technology, processes/organization, environment, characteristics of knowledge. Then the author rejected barriers that were not selected by the respondents in the initial stage of the survey and conducted an in-depth interview on the others.

The table below presents the results – barriers identified by employees in each business area of the organization.

Table 4. KM barriers according to business areas – results.

	1	2	3	4	5	6	7	8	9
O: Lack of an appropriate reward for acquiring new skills and knowledge			+	+					+
T: Lack of technical support of integrated technology to support KM tools requirements	+	+		+	+	+	+	+	+
O: Lack of formal authority on the part of the innovator	+	+	+		+			+	+
O: Lack of fit between innovation and organizational assumptions, existing occupational mindsets, beliefs, etc.	+	+			+		+	+	+
O: Lack of teams, work groups and communities of practice for collaboration around work-related issues and challenges		+	+	+		+			+
P: Lack of slack times and heavy workload	+	+		+	+		+		+

O: Poor targeting of required information in order to generate needed knowledge in KM system		+	+				+		+	+
K: Staff's ambiguity about what the information/knowledge is exactly supposed to be used for			+						+	+
P: Lack of top management support (supporting new ideas, establishing sufficient technical infrastructure, encouraging and so on)		+	+	+	+	+	+	+	+	+
O: Poor coordination among functions caused by top-down leadership style		+	+	+	+	+	+	+	+	+
O: Inconsistencies between strategy, systems, policies and practices		+	+						+	
T: Staff's reluctance to use integrated IT systems and tools due to lack of familiarity and experience with systems and tools	+	+								+

Question 1: In which group of employees were the most barriers identified?

Answer: Field Staff, HR, IT & Law.

Question 2: What barriers were identified by employees most frequently?

Answer: Lack of technical support of integrated technology to support KM tools requirements, Lack of top management support, Poor coordination among functions caused by top-down leadership style

Question 3: What group of barriers were identified by employees most frequently?

Answer: Processes/Organization (O)

Field workers (assemblers) are among the group of workers who indicated the most barriers related to knowledge management in their area of operation. The barriers they indicated relate mainly to organizational and technical issues. This may be related to the average lowest level of education of this group of respondents and low awareness of knowledge management needs. These employees are in possession of high technical knowledge. The low competence in the area of Knowledge Management by HR staff is worrying, as they make strategic decisions in the company. The high number of barriers

indicated by the IT area, especially in the organizational aspect, is most probably caused by the large number of supported systems of a multiple nature (from strictly industrial systems such as SCADA systems, through SAP to office applications such as MS Office), which results in disorganized knowledge.

It is noteworthy that among the barriers most frequently mentioned by employees are those that relate to organizational issues. Both in terms of personnel and technical issues.

5 Conclusions

As the universally accepted and well-documented results of scientific research show, humanity, in order to avoid the most severe global warming, must radically reduce its greenhouse gas emissions by half within 10 years, and ultimately to zero by 2050.

The need for a rapid phase-out of fossil fuels in the energy sector is not only due to climate concerns, but also for economic reasons.

Peak sources to replace coal-fired power stations include gas-fired power stations. Modernization and expansion of transmission networks will be of key importance, including their adaptation to the increasing dispersion of electric energy sources. This means an increase in interest in gas on the market and therefore an increase in competitiveness. This means an increase in interest in gas on the market and therefore an increase in competitiveness. Companies wishing to build their market position and competitive advantage will compete in the area of the development of new technologies. Launching of new solutions is closely linked to the acquisition, possession and use of specialist knowledge. Knowledge has already become one of the key resources in organizations and its role is constantly growing. This process cannot take place without effective management.

As a study conducted in one of the leading companies in the gas sector in Poland shows, there is a lot to be done in this area.

The basis is understanding the essence of knowledge management and treating this process as one of the priorities. Many years of neglect in this area cause lack of awareness and knowledge of tools for effective acquisition, consolidation and transfer of knowledge. According to ageing workforce, action to improve knowledge management in the gas industry needs to be taken immediately, otherwise key knowledge will be irretrievably lost along with a large group of departing employees.

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