Decision-making in the knowledge processing in enterprises in the Czech Republic

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Abstract—In a globalized world, the Czech economy interferes with a number of challenges, which the processes of integration bring. For businesses that want to succeed in global competition, the key factors are knowledge and ability to make the best use of the knowledge. The aim of this paper is to introduce the research on the acquisition and preservation of knowledge as a resource for decision-making in enterprises in the Czech Republic. The survey was carried out at the University of Hradec Králové. In total, 678 organizations operating in the Czech Republic across all sectors were contacted, with a focus on small and medium enterprises. 251 completed questionnaires were obtained.

As revealed from the results of the survey, Czech enterprises perceive knowledge management as an important means for increasing competitiveness. For its systematic application in business practice, however, there are still some steps missing.

Keywords— knowledge, knowledge management, information technology, enterprise, questionnaire.

I. INTRODUCTION

In recent years, knowledge management has become part of the strategy of many enterprises, because of the need of rapid assessment of situation, speed sourcing, the need of faster communication and the better quality of co-operation. The development of knowledge and their full utilization in enterprises are significantly influenced by the efficiency of the operation of all other factors (people, machines, materials, etc.), which means it complements them and greatly enhances their effectiveness. [11].

The Czech Republic tries to succeed in the new competitive environment. This is demonstrated by various projects focused on systematic work with the current knowledge at the level of towns, villages and enterprises themselves. As an example, the ongoing project in the Ústecky region can be mentioned, which was created with the help of the European Social Fund (ESF) and the state budget, the project is “With knowledge to become prosperous II“. Its content is an electronic administration of documentation of management system, management of human resources, integrated management system and standards of health and safety protection at work.

However, it is also possible to meet with rejection attitudes, for which the term is just a modern name for old and well known processes, which have currently taken slightly different forms. President Vaclav Klaus in his interview [Kartous, 2006] denied terms such as educational society and knowledge-based economy with the fact that these terms are empty and caricating the nature of the economy and society. Vaclav Klaus believes that these concepts, although they are current, in essence they do not affect the present, because these phenomenon were and are contained in the historical present forms.

Despite the existing dismissive attitudes in the private sector, the number of consultancy firms offering professional advisory services for knowledge management projects are growing. The most famous include Ernst and Jung and Andersen Consulting. Even the newly created departments focusing on knowledge management at leading software companies such as Lotus, Oracle and Microsoft, are not far behind.

In the field of knowledge management, there are a number of ongoing researches, with various concentrations ([12], [7], [3], [15], [8], [4], [14], [9], [16]). For example, research work of Directions and Trends in knowledge management research, conducted by George M. Giaglis from Aegean University in Greece, examined over two hundred projects in the area of knowledge management, which were carried out within the European Union [Giaglis, 2003]. The researches showed that it is a very perspective area, but now with some reserves. The vast majority of researches on knowledge management and knowledge, due to EU requirements conditioning the funding of these projects, are either from the field of applied research or research of almost or entirely commercial matters [13].

From the above mentioned characteristics it is clear that although in the case of knowledge management it is a young and dynamically developing discipline, its implementation is meaningful and beneficial. For this reason, the University of Hradec Kralove conducted research to analyze the acquisition and preservation of knowledge in Czech enterprises. In connection with the issue, the following hypotheses were set up, that will be either confirmed or refuted on the basis of the survey results:
H1: Enterprise size does not significantly affect the type of knowledge provided to employees.
H2: Enterprise size significantly affects the use of information technologies in the field of preservation of knowledge.

II. METHODOLOGY

Within the analysis of knowledge, the method of "test of independence in contingency table" was used. Under this method, a file is considered, divided according to two statistical features into r groups by first character, and s groups according to the second character. On the basis of a random selection of n size, independence of these two statistical characters are tested. When the validity of the hypothesis of independence, the frequency of individual variants \( n_{ij} \), for \( i = \{1, 2, \ldots, r\}, j = \{1, 2, \ldots, s\} \) correspond with the values of expected frequency calculated according to the relation [1].

\[
\text{The test of independence in the contingency table, can be considered credible, if the n}_{ij} \text{ expected frequency of occurrence exceeds a value of 5 in at least 80% of each group and each of the expected frequency is higher than value 1. [1].}
\]

A. Numerical steps of the method

1) Determination of hypotheses

The following hypothesis is tested:

\[
\begin{align*}
H_0: \ n_{ij} &= \frac{n_{i}n_{j}}{n} \quad &\text{for all } i = \{1, 2, \ldots, r\}, j = \{1, 2, \ldots, s\} \\
H_A: \ n_{ij} &= \frac{n_{i}n_{j}}{n} \quad &\text{for some } i, j, \text{ where expected frequency } n_{ij} \text{ are}
\end{align*}
\]

\[
\begin{align*}
n_{ij} &= \frac{n_{i}n_{j}}{n} \quad \text{for some } i, j, \text{ where expected frequency } n_{ij} \text{ are} \\
\quad &= \sum_{j=1}^{s} n_{ij} \quad \text{for some } i, j, \text{ where expected frequency } n_{ij} \text{ are}
\end{align*}
\]

As a test criterion the following statistics are used:

\[
G = \sum_{i=1}^{r} \sum_{j=1}^{s} \frac{(n_{ij} - n_{ij}')^2}{n_{ij}'}
\]

Statistics G has a \( \chi^2 \) distribution with \( df = (r - 1)(s - 1) \) degree of freedom. The critical value will be found by using an Excel spreadsheet, where CHIINV(\( \alpha \), df) statistical function will be used. The formula for the critical value is \( X^2_{1-\alpha/2,df} \). Null hypothesis is not refused under condition:

\[
G \leq X^2_{1-\alpha/2,df}
\]

III. THE QUESTIONNAIRE SURVEY

The aim of the survey was to analyze the work with knowledge in Czech enterprises focusing on services. The survey was conducted among employees of Czech enterprises. The questionnaire contained ten questions relating to knowledge in an organization. Questions were divided into seven thematic headings:

a) analysis of the acquisition of knowledge,
b) analysis of storing knowledge,
c) analysis of available knowledge,
d) analysis of knowledge sharing,
e) analysis of knowledge dissemination and publication,
f) analysis of survey of knowledge,
g) analysis of the remuneration of knowledge.

Given the scope of research, attention in this paper is devoted to acquisition and preservation of knowledge. Within the analysis of acquisition of knowledge, attention was focused on:

a) ways of gaining knowledge of emerging employees,
b) knowledge provided to emerging employees,
c) support for improving professional qualification,
d) forms of enhancement of the professional qualification of employees,
e) knowledge provided to employees.

Within the analysis of the preservation of knowledge, attention was focused on:

a) storage forms of knowledge,
b) use of information technology to store knowledge.

B. Survey respondents

The survey was focused on Czech enterprises divided into two groups according to size, on small enterprises with up to 50 employees and medium enterprises with up to 250 employees [2]. The survey was carried out using the portal www.vyplnto.cz, while the questionnaire was published on various Internet forums. Respondents were asked 12 questions. The questionnaire was portrayed 678 times in total, of which 251 were successfully completed. In this case, the return of the questionnaire was 37%.

The graphs show the distribution of respondents by the size of enterprises. In terms of departmental affiliation, all sectors were represented, mostly the enterprises focused on providing services (53.8%).

Fig. 1 distribution of respondents according to the size of an enterprise
1) Analysis of obtaining knowledge
In the analysis, particular attention was focused on obtaining knowledge of new coming employees as well as existing employees.

a) Methods of obtaining knowledge of entering employees
Surveys show that during training staff, the greatest emphasis is put on the method of apprenticeship. First of all, in both small and large businesses, the training is given by existing employees, then secondly is specialized training, only 2.3% of respondents surveyed of large firms do not have training of any kind.

![Fig. 6 the learning curve of entering employees](Source: own source and [16])

b) Knowledge provided to emerging employees
Enterprises can provide tacit and explicit knowledge to emerging employees. I consider tacit knowledge as those obtained by learning from current employees and vocational training. Explicit knowledge is provided by printed material.

The survey shows that businesses provide tacit knowledge to the incoming employees to the greatest degree. This fact was evident from the first graph, where the greatest degree was represented by learning from a current employee.

![Fig. 7 available knowledge to new emerging employees](Source: own source and [16])

c) Support for improving professional qualification
As support for raising professional qualification, employees consider the available promotional materials, training and knowledge contained in the information system. In the following chart, we can see that a large part of the businesses support the growth of the professional qualifications of its employees. For large companies it is 84.8% and 78.2% of small from the respondents surveyed.[16]

![Fig. 8 support for improving professional qualification](Source: own source and [16])

d) Forms of enhancement of the professional qualification of employees
The survey showed that despite strong support of businesses, 46.6% of employees of small businesses and 45.7% of employees of large companies increase their professional qualifications by individual preparation and thus enrich their tacit knowledge. For large enterprises, the smallest representation has the form of "providing promotional materials" and for small businesses it is the form of "using the information system."

![Fig. 1 forms of enhancement of the professional qualification of employees](Source: own source and [16])

e) Knowledge provided to employees
Enterprises can provide explicit and tacit knowledge to employees, in the case of raising the professional qualifications. Providing tacit knowledge is done through specialized training. The forms of providing explicit knowledge include promotional materials and the knowledge contained in the information system. The survey shows that explicit knowledge has the largest representation in the case of providing knowledge to enhance professional skills.

![Fig. 9 forms of enhancement of the professional qualification of employees](Source: own source and [16])
Test of independence

Using the statistical method of "Test of independence in contingency table", we will test at 5% of significance level whether the size of enterprise affects the given knowledge. We test the hypothesis $H_0$, which shows that the size of companies doesn’t matter, against the alternative hypothesis $H_A$ that shows that it depends on the size of the business in the field of providing knowledge to employees. The real data written in the table:

<table>
<thead>
<tr>
<th>Provided Knowledge – Real Data</th>
<th>Small enterprise</th>
<th>Large enterprise</th>
<th>$n_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>26</td>
<td>20</td>
<td>46</td>
</tr>
<tr>
<td>Tacit</td>
<td>29</td>
<td>31</td>
<td>60</td>
</tr>
<tr>
<td>Explicit</td>
<td>41</td>
<td>45</td>
<td>86</td>
</tr>
<tr>
<td>Tacit + Explicit</td>
<td>23</td>
<td>36</td>
<td>59</td>
</tr>
<tr>
<td>$n_j$</td>
<td>119</td>
<td>132</td>
<td>251</td>
</tr>
</tbody>
</table>

The expected data written in the table:

<table>
<thead>
<tr>
<th>Provided Knowledge – Expected Data</th>
<th>Small enterprise</th>
<th>Large enterprise</th>
<th>$n_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>21,80876</td>
<td>24,191235</td>
<td>46</td>
</tr>
<tr>
<td>Tacit</td>
<td>28,44622</td>
<td>31,553785</td>
<td>60</td>
</tr>
<tr>
<td>Explicit</td>
<td>40,77291</td>
<td>45,227092</td>
<td>86</td>
</tr>
<tr>
<td>Tacit + Explicit</td>
<td>27,97211</td>
<td>31,027888</td>
<td>59</td>
</tr>
<tr>
<td>$n_j'$</td>
<td>119</td>
<td>132</td>
<td>251</td>
</tr>
</tbody>
</table>

Test criterion

$$G = \sum_{i=1}^{r} \sum_{j=1}^{s} \frac{(n_{ij} - n_{ij}')^2}{n_{ij}'} = \frac{(26 - 21.8)^2}{21.8} + \cdots + \frac{(36 - 31.03)^2}{31.03} = 3.2351$$

Tested criterion has a $\chi^2$ distribution with $df = (4-1)*(2-1) = 3$ degree of freedom.

Critical value

$$X^2_{0.05;3} = 7.814728$$

Result

$$G = 3.235 < X^2_{0.05;3} = 7.814728$$

At the significance level of 5%, the null hypothesis is not refused. Enterprise size doesn’t significantly affect the type of knowledge provided to employees.

2) Analysis of storing knowledge

In this part of the research the ways of storing knowledge were analyzed. Attention was also focused on the use of information technology for storing knowledge.

a) Forms of storing knowledge

Furthermore, the investigation revealed that the most widely used method for storing knowledge in both small and large companies, is storage in the computer network. According to theory of data warehouses, we can call this method "storage model", which is used by 58.8% of small businesses and 60.6% of large enterprises.

Another model of data warehouse, which is used, is the hybrid model in the form of an information system for gathering knowledge. The model is used by 30.3% of small businesses and 36.4% of large enterprises.

b) Using of information technology to store knowledge

Information technology in the form of an information system for the collection of knowledge and storage in a computer network is used to store knowledge by 69.7% of small and 84.8% of large businesses. After the test of independence in a contingency table can be said, that company size significantly affects the use of information technology in the field of storing knowledge.
Support from businesses in increasing qualifications of employees seems to be high. But despite this fact, a large group of employees enhances their knowledge by individual access. This suggests that the skills provided are probably insufficient. Support for increasing the qualifications of employees is definitely a good step, in that it can help keep the company competitive. Therefore, enterprises should focus on quality and appropriateness of provided knowledge.

From the perspective of knowledge management, the best way to preserve knowledge is the use of information technology in combination with information systems. The survey shows that 70% of small and 85% of large companies use information technology to store knowledge. From that, 30.3% of small and 36.4% of large sized businesses use information systems for storing knowledge. For such an enterprise, this information system is a great benefit and in case of finding, creating, distributing, storing knowledge it makes their job easier.

V. CONCLUSION

Knowledge management as a systematic approach to acquiring and preserving knowledge, greatly complements and enhances other activities in an enterprise. Nowadays, knowledge has the potential to become one of the strategic resources of enterprises and can provide competitive advantage.

The research objective was to analyze the state of knowledge management in the field of promoting and treatment of knowledge in Czech enterprises. The reason for focusing on this area was the fact that the mere gathering of knowledge, without its active use, has no meaning for an enterprise. It can be said that small and medium enterprises in the Czech Republic understand the importance of working with knowledge, but they haven’t mastered the overall systematic approach to this area.

REFERENCES