LEVEL OF EMPLOYEES KNOWLEDGE OF COMPANY AND INFORMATION STRATEGY

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Abstract

The Company’s strategy is a key way to the effective work of a company. Information strategy is its significant part. In this article we look at analyzed answers from 1204 questionnaires. Within the research of efficiency information systems we analysed level of employees knowledge of company and information strategy. Questionnaires were analyzed by the criteria consisting of geographical structure (Czech Republic and rest of EU), respondents work positions (managers and executive officers) and others. The project aims to carry out a survey using as many employees of both domestic and foreign companies as possible with a view to identifying and confirming hypotheses about key problems of inefficiency of information systems and technologies. The notion of inefficiency is understood in accordance with (Molnár, 2000) as cooperation of efficiency and effectiveness. This article describes gained results in the knowledge of strategy.

Keywords: Efficiency, information systems, company strategy, IT strategy, formal concept analysis.

JEL Classification: L21, M21, M15.

Introduction

At the Faculty of Business and Management, Brno University of Technology has provided research for Identification of key areas for assessment of information systems’ efficiency (Sodomka, 2006). This research was based on web survey. The survey aimed to identify areas relevant for further research. One of the basic reasons of the inefficiency of information’s systems is the out of control ICT development without clear defined information strategy (Maryška, 2007).

The survey looks into the following areas:
- Users’ satisfaction with an information system
- Users’ satisfaction with the level of information support
- Quality of training provided to users
- Information systems used
- Employees’ awareness of corporate objectives given their roles
- Character of information strategy in a company
- Experience with outsourcing and Application Service Providing
- Perception of trends in information and communications technologies

The queries cover the whole spectrum of six key areas of the Model of Efficiency of an Information System by (DeLone, 2004). From the survey areas above we chose one of the known inefficiency areas, which was the information’s systems of company’s and information strategy. We tried to analyze the level of knowledge and the involvement of employees in the strategy of a company. We used the clustering method, Formal Concept Analysis (FCA) to find some interesting clusters in source data. We chose the clustering method as an alternative to classic statistical methods often used for analyzing source data. The FCA method is very easy to use for analysing questionnaires. In this research we divided answers by the geographical position of companies, size of companies and some defined group of employees.

Geographical place of companies:
- Czech Republic and Slovakia (CZ)
- Rest of countries inside EU
Size of the companies (employees):
- less than 10
- 10..49
- 50..99
- 100..199
- 200..499
- 500..999
- More than 1000

The users were divided into the following four interest groups:
- Primary Processes Manager
- Secondary Processes Manager
- Primary Processes Executive Officer
- Supporting Processes Executive Officer

The division resulted from the need to look into various efficiency areas of an information system and the availability of information to different kinds of users – e.g. the awareness of the information strategy is relevant for managers, and not for executives. Although company and information strategy is relevant for managers, it is without doubt that knowledge and the help of executive officers in the company can be very use full for success (Kanugo, 1999).

**Questionnaire**

A questionnaire containing 40 questions was created for the survey, some of which were redundant, differently phrased and serving to verify the input data and eliminate random answers. The questionnaire was translated into six languages – Czech, English, German, French, Bulgaria and Polish. It was used for the first stage of the survey, pilot verification of the areas in question and the method of data collection, and verification of the complexity, and the applicability of the questions. 1204 usable questionnaires were obtained. This number of usable questionnaires was selected from a total of 1257 questionnaires. Some of the questionnaires used in the clustering were removed because not all questions were answered (Koch, 2010).

**Data collection**

The data collection was carried out in two stages. The first group gained 272 usable questionnaires. A six-language web application was created for the second group and 1712 randomly selected respondents were approached. Of all the approached respondents, 987 people were interested in participating in the survey (52% success rate).

**Data summary**

<table>
<thead>
<tr>
<th>Company size</th>
<th>&lt;10</th>
<th>10..49</th>
<th>50..99</th>
<th>100..199</th>
<th>200..499</th>
<th>500..999</th>
<th>&gt;1000</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CZ</td>
<td>137</td>
<td>259</td>
<td>106</td>
<td>89</td>
<td>83</td>
<td>105</td>
<td>133</td>
<td>912</td>
</tr>
<tr>
<td>EU</td>
<td>51</td>
<td>34</td>
<td>20</td>
<td>23</td>
<td>16</td>
<td>14</td>
<td>74</td>
<td>232</td>
</tr>
</tbody>
</table>

**Formal Concept Analysis (FCA)**

Formal concept analysis is one of the data mining methods. It deals with particular kind of analysis of data which are mainly in the form of table. This method finds clusters (formal concepts) in source data. The table consists of rows corresponding to objects and columns corresponding to attributes (properties, characteristics). The table in each cell contains 1’s or 0’s depending on whether an object has or doesn’t have an attribute. This table is in formal notion called context. (Carpinetto, 2004)

The context is the triple \( \langle X, Y, I \rangle \) consisting of two sets \( X \) and \( Y \) and binary relation \( I \) between \( X \) and \( Y \). \( X \) is set of objects and \( Y \) is sets of attributes. Relation \( I \) is also called the incidence relation of the context. The fact that \( (x, y) \in I \) is interpreted that object \( x \in X \) has attribute \( y \in Y \). For each set of objects \( A \subseteq X \) and set of attributes \( B \subseteq Y \) we create sets \( A^\uparrow \) and \( B^\downarrow \) with these properties:

\[
A^\uparrow = \{ y | \text{ for each } x \in A : (x, y) \in I \}, \quad B^\downarrow = \{ x | \text{ for each } y \in B : (x, y) \in I \}. \tag{1}
\]
On other words, $A^\uparrow$ is the set of all attributes common to the objects in A, while $B^\downarrow$ is the set of all objects which all have attributes in B.

A formal concept of a context $\langle X, Y, I \rangle$ is pair $\langle A, B \rangle$ where $A \subseteq X$ and $B \subseteq Y$ and sets meets requirements $A^\uparrow = B$ a $B^\downarrow = A$ on it. Formal concept is composite of set of objects A (we call it extent) and set of attributes B (we call it intent). This formal definition of concept reflects one common meaning of concept in standard language with philosophical roots dating back to the Aristotle.

Set of all concepts of the context $\langle X, Y, I \rangle$ is denoted by $\beta(X, Y, I)$

\[
\beta(X, Y, I) = \{ \langle A, B \rangle \mid A^\uparrow = B, B^\downarrow = A \} \tag{2}
\]

On $\beta(X, Y, I)$ we can define relation of order $\leq$:

$\langle A_1, B_1 \rangle \leq \langle A_2, B_2 \rangle$ if $A_1 \subseteq A_2$ (or equivalently, $B_2 \subseteq B_1$). \tag{3}

The fact that $\langle A_1, B_1 \rangle \leq \langle A_2, B_2 \rangle$ is interpreted as each object from set $A_1$ is include in $A_2$ (or equivalently each attribute from set $B_2$ is include in set $B_1$). Relation $\leq$ is therefore hierarchical relation (relation sub concept – super concept). Set of all formal concepts (clusters in data) $\beta(X, Y, I)$, together with relation $\leq$ is complete lattice. In the meaning of formal concept analysis we denoted it as conceptual lattice. Details can be found in (Ganter, 1999).

**Using FCA on the survey**

Each questionnaire consisted of questions to which the respondents chose an answer from multiple choices (Service Quality, 1995). From the perspective of the FCA group of respondents, it can be seen as a set of objects and the questions in the questionnaire as attributes. The respondents’ answers made binary relations between the set of objects and the set of attributes. The answers were not bivalent (yes-no). There were multiple value types of answers. Due to this fact, we used conceptual scaling to create an appropriate context.

After the conceptual scaling we obtained a context that contained 1204 objects (rows) and 177 attributes. The context contained 42 921 relations between objects and attributes. The fill factor of the context table was close to 20%. In this context we found 95 551 180 concepts. These number of concepts was hard to observe, so we used constraints for finding concepts. We had to find only concepts that contained only relevant interested questions from the questionnaire. (Bělohlávek, 2005)

After this simplification we obtained 11 936 879 concepts. Which was still too much. In our research we selected from this huge amount of concepts only the concepts which had more than 120 objects (in natural meaning respondents). This is 10% or more of all respondents. At this level of accuracy we got 1437 concepts with more than 120 respondents. All results presented in this article are from this set of concepts. The software, LatticeNavigator, was used for the working with conceptual lattice, which was created by the authors of this article.

**Evaluation**

The clusters which were obtained from FCA had to include 4 questions about company strategy. These clusters were hierarchically divided by geographical place of companies, working positions of employees and finally by the size of the company.

**Evaluation knowledge aims and strategy of the company**

A question from the questionnaire:

*Do you have any information about your organization’s strategy that makes it clear what it aims to achieve in the near future? Do you know what the strategic goals of your organization are?*

Possible answers:
- Yes, I know enough about the strategy / aims of my organization
- I have partial knowledge about the goals
- I don’t know anything about the organization’s strategy
- I participate in the strategic planning of my organization
In Figure 1 it is shown the total percentage of employees who have some knowledge of company strategy. From this global point of view the knowledge of the employees from the rest of the EU, in general is slightly more than in the Czech Republic. What is interesting, is that there is quite a high knowledge (up to 11%) of company strategy in the group of supporting process executive officers in the EU. These rates show us that company strategy in the EU companies is very well known for all groups of employees. This could be one of the reasons for higher efficiency of information systems in the companies. Marginal parts of employees know company aims and they can do everything to fulfil them.

Table 2. Total knowledge of the company strategy divided by size of the company (in %)

<table>
<thead>
<tr>
<th>Company size</th>
<th>&lt;10</th>
<th>10..49</th>
<th>50..99</th>
<th>100..199</th>
<th>200..499</th>
<th>500..999</th>
<th>&gt;1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Processes Manager</td>
<td>CZ 98</td>
<td>EU 96</td>
<td>CZ 93</td>
<td>EU 92</td>
<td>100</td>
<td>100</td>
<td>88</td>
</tr>
<tr>
<td>Secondary Processes Manager</td>
<td>91</td>
<td>---</td>
<td>96</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Primary Processes Executive Officer</td>
<td>89</td>
<td>80</td>
<td>85</td>
<td>82</td>
<td>80</td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td>Supporting Executive Officer</td>
<td>79</td>
<td>100</td>
<td>71</td>
<td>75</td>
<td>69</td>
<td>50</td>
<td>90</td>
</tr>
</tbody>
</table>

In the Table 2 it is shown a detailed segmentation of the survey. In the table above, the values which aren't filled in refer to the parts that weren't answered in the questionnaires. According to this table, there is a quite a similar knowledge of the company strategy in the Czech Republic and the rest of the EU within managers' positions. As we assumed, there are higher differences in the executives' positions of the employees. In the EU companies we can observe quite a stable tendency of the knowledge of employees than in the Czech Republic.

Evaluation of the knowledge of employees about the information strategy of the company

A question from the questionnaire:
Do you have any idea about your organization’s IT strategy / goals (what the information system should look like in the near future)?

The possible answers are the same as in the previous question.

From Figure 2 we can see that knowledge information strategy in the Czech Republic is, at all working positions, lower than the rest of the EU. This decrease is about 6% in managers’ positions. In the executive positions, there is a decrease compared to the EU companies up to 20%. This difference is too high and therefore a research has to be done, for getting more exact results and deeper analysis of these results. When we take a look into the segmentation of our results by the company size, there is a big proportion of managers who have a knowledge of information strategy.
Figure 2. Total knowledge employees of the information strategy by their work position

<table>
<thead>
<tr>
<th>Company size</th>
<th>&lt;10</th>
<th>10..49</th>
<th>50..99</th>
<th>100..199</th>
<th>200..499</th>
<th>500..999</th>
<th>&gt;1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Processes Manager</td>
<td>79</td>
<td>85</td>
<td>89</td>
<td>85</td>
<td>100</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>Secondary Processes Manager</td>
<td>82</td>
<td>50</td>
<td>71</td>
<td>100</td>
<td>60</td>
<td>100</td>
<td>86</td>
</tr>
<tr>
<td>Primary Processes Executive Officer</td>
<td>61</td>
<td>73</td>
<td>61</td>
<td>64</td>
<td>52</td>
<td>67</td>
<td>55</td>
</tr>
<tr>
<td>Supporting Executive Officer</td>
<td>36</td>
<td>71</td>
<td>60</td>
<td>63</td>
<td>39</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

This is a very positive situation for the fulfilment of information strategy. At the executives' level, the differences are bigger between companies in the Czech Republic and the EU. We can infer from it that in the Czech Republic the executives are not very well informed about the company’s information strategy. IT strategy of the company has to support not only managers but it also has a significant impact on the executives' performance and executives have to participate in the information strategy.

Evaluation of the knowledge on meeting the strategic aims of the company

A question from the questionnaire:

*Does your immediate superior update you on a regular basis if the strategic goals of your organization are met?*

Possible answers:

- Never
- Sometimes
- Regularly
- I participate in the evaluation of our strategic goals

Due to the fact that an average of 88% (90%) of all employees in the Czech Republic (EU) have some knowledge about company strategy, the value 88% (91,5%) average knowledge about meeting strategic aims of the company, seems to be an interesting value. This can suggest that, all employees that have some knowledge about company strategy have a good view of meeting the strategy aims. This is very useful for the achievement of company strategy and efficiency information systems. The slightly higher percentage in the EU companies could be generally caused by a smaller number of EU companies compared to the companies from the Czech Republic.
Figure 1 Total knowledge employees on meeting the strategic aims of the company

Table 4. Knowledge employees on meeting the strategic aims of the company divided by company size

<table>
<thead>
<tr>
<th>Company size</th>
<th>&lt;10</th>
<th>10..49</th>
<th>50..99</th>
<th>100..199</th>
<th>200..499</th>
<th>500..999</th>
<th>&gt;1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Processes Manager</td>
<td>CZ</td>
<td>EU</td>
<td>CZ</td>
<td>EU</td>
<td>CZ</td>
<td>EU</td>
<td>CZ</td>
</tr>
<tr>
<td>Secondary Processes Manager</td>
<td>92</td>
<td>93</td>
<td>96</td>
<td>100</td>
<td>91</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Primary Processes Executive Officer</td>
<td>91</td>
<td>100</td>
<td>92</td>
<td>50</td>
<td>87</td>
<td>100</td>
<td>86</td>
</tr>
<tr>
<td>Supporting Executive Officer</td>
<td>89</td>
<td>80</td>
<td>83</td>
<td>91</td>
<td>86</td>
<td>92</td>
<td>95</td>
</tr>
</tbody>
</table>

Evaluation of personal contribution to meeting the strategic aims of the company

A question from the questionnaire:

Does your immediate superior inform you about your contribution to meeting the strategic goals of your organization?

The possible answers are the same as in the previous question.

Figure 2. Personal contribution to meeting the strategic aims of the company
Table 5. Personal contribution to meeting the strategic aims of the company divided by the company size

<table>
<thead>
<tr>
<th>Company size</th>
<th>&lt;10</th>
<th>10..49</th>
<th>50..99</th>
<th>100..199</th>
<th>200..499</th>
<th>500..999</th>
<th>&gt;1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Processes Manager</td>
<td>CZ 87</td>
<td>EU 85</td>
<td>CZ 91</td>
<td>EU 100</td>
<td>CZ 80</td>
<td>EU 100</td>
<td>CZ 91</td>
</tr>
<tr>
<td>Secondary Processes Manager</td>
<td>CZ 73</td>
<td>EU 100</td>
<td>CZ 92</td>
<td>EU 100</td>
<td>CZ 80</td>
<td>EU 100</td>
<td>CZ 95</td>
</tr>
<tr>
<td>Primary Processes Executive Officer</td>
<td>CZ 83</td>
<td>EU 80</td>
<td>CZ 77</td>
<td>EU 82</td>
<td>CZ 77</td>
<td>EU 80</td>
<td>CZ 100</td>
</tr>
<tr>
<td>Supporting Executive Officer</td>
<td>CZ 82</td>
<td>EU 86</td>
<td>CZ 65</td>
<td>EU 75</td>
<td>CZ 44</td>
<td>EU 100</td>
<td>CZ 86</td>
</tr>
</tbody>
</table>

From Table 5 we can see a higher personal contribution in meeting the strategic aims of a company in companies from the EU. In the Czech Republic, this personal contribution is up to 79%. This value is close to 10% lower than in the EU companies. From the previous chapters we can see that the level of knowledge of employees is very stable. The differences between groups of employees are not higher than 5% in the EU. The same factor in the Czech Republic is varying around 10%.

Conclusion

The FCA method was used for the analysis of the questionnaires because we wanted to find interesting clusters in the source data. From the obtained results we can estimate that the considered indicators were at a really high level (about 80%) and the differences between companies in the Czech Republic and the rest of the EU are up to 10%. We can identify other factors such as age of the company or of its employees. These factors were identified with the help of cluster analysis and will be evaluated in the future work.

What was very interesting were the findings that the knowledge of IT strategy in the Czech Republic, at all working positions, is lower than in the rest of the EU. The difference is up to 6% in the managers’ positions and up to 20% at executive employees’ positions. This difference is really high and we need to focus on it more precisely in the future. If all our results are right, we a found potential strong source of inefficiency information systems in the Czech Republic.

References