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Increase in the Competitiveness of SMEs using Business Intelligence in the Czech-Polish border areas.

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***Abstract*—The paper addresses tools that support knowledge-based management. These tools are referred as Business Intelligence. Competitive Intelligence is also discussed. They transport data into comprehensive information about company processes and real-world impact on their progress. Basic principles of these applications are also described. The paper presents the results of the questionnaire survey conducted among SMEs in the Czech-Polish border area. The questions are focused on the use of these tools and intensions in cloud exploitation. The results and the lack of show a considerable interest in the use of Business Intelligence applications awareness of business managers with regard to Cloud computing possibilities.**

I. Introduction

GLOBAL economic models are undergoing profound changes which include e.g. global competition, global transfers and changes in the way of work in many industries or the pressure on the qualification of the workforce. In developed countries, this causes a gradual shift to an economy of intangible assets and relationships [1]. These changes are underpinned by the key role of information and communication technologies (ICT) providing modern infrastructure, which allows implementing most of the changes. Simultaneously, ICT provides tools to increase performance, competitiveness and innovation in virtually all areas of the economy.

Managers currently have access to a considerable amount of data available from a variety of sources. To make decisions, they need an efficient tool that would help them process data to obtain necessary information. Such tools are Business Intelligence (BI) applications that specifically aim to provide decision support to managers. These tools allow them to analyses the situation in their own company, provide access to information from external company environment and based on the processed data, provide the managers with early warning of existing threats and highlight new business opportunities [2].

At the same time, the range of Competitive Intelligence (CI) tools and methods is expanding. The CI tools and methods introduce into management sophisticated methods of work for contextual search in external information sources through the Internet [3].

New opportunities for managers are also brought about by the new Cloud Computing (CI) technologies provided by ICT companies as a service. While part of company managers is aware of the existence of CI, the majority are still distrustful of it or have no idea what the term means.

II. Increasing the Entrepreneurial Potential of Using ICT in the Czech-Polish Border Area

Since 2012, the Department of Applied Informatics, VSB-TU Ostrava has been conducting a research "Application software for decision support in small enterprises in the Czech-Polish border area". This research is conducted jointly by the Department of Economic Informatics, University of Economics in Katowice.

The survey results also confirmed that the adoption of ICT present an adaptive challenge, not a technical problem. It provides the SMEs with several advantages, especially at the tactical and operational level of management.

- At the level of operational management: an increase in the quality of data management, communication, decision making, data exchange, improving cash-flow control, gradual transition to work with digital documents, shortening the response time to queries (improving customer relations, company profile).
- At the tactical level: rapid response to changes, promotion of teamwork, more flexible scheduling, flexible processing of offers, better integration of business processes, and overall improvement in efficiency and effectiveness.

Although information is today recognized as an important means of creating added value, there is a lack consistency between ICT and business. The basis to solve these problems can be found in the balance between the global and information strategies of the company. These strategies must be prepared on the same basis and with the same weight (attention). The truth is that most SMEs typically do not pay attention to the information strategy – creating IS and ICT development plan in the company in the long term. They are focused on current issues in the struggle to keep the company on the market.

A company information strategy mainly aims to strengthen the link between IS and ICT development in the company and its global strategy in order to subsequently increase its competitiveness and support the development of new forms of business.

When preparing the IS strategy in the longer term, it is necessary to consider four aspects of the IS: achieving the intended objective (effectiveness), efficiency, reliability and continuity of its development.

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III. Methodology, Data, Results and Discussion

Part of the survey focuses on segmenting entities by type of the applications used and by their relationship to the type of ICT service provision. A sub-aim is to familiarize the respondents with a range of options currently offered to purchase, operate and maintain ICT and to determine the level of awareness of companies about the possibility to use cloud computing. Previous results in these areas confirm very similar approaches in the border area concerned.

The survey also includes a questionnaire survey carried out in electronic form on both Czech and Polish sides of the region. The outcome of the project was 160 replies from both Czech (100 responses) and Polish (60 responses) companies. The return rate of the questionnaire on the Czech side was 18.4% (105 responses of 572 questionnaire views). The return rate of the questionnaire on the Polish side was 16.5% (75 responses of 455 questionnaire views). Average time to fill out a questionnaire was about 11 minutes.

The questionnaire is divided into eight interconnected parts: **A, B** (present and future use of ICT tools), **D** (data sources to support decision-making processes), **M** (modules used within IS), **E** (what are your preferences in software procurement), **F** (software functions important to select ICT), **G** (way of ICT maintenance) and **I** (company identification).

The part concerning the applications used is divided into four groups:

A1, B1 – Application for personal IT – office software; antivirus; compression software.

A2, B2 – IT support for key processes in your organization (production, storage, logistics, billing, human resources, inventory, accounting, purchase and sale, etc.).

A3, B3 – Information technology at the tactical management level (MIS – an economic software, using data provided by systems at the operational management level).

A4, B4 - Comprehensive BI solution.

For these four types of applications, intensity of use in the present is examined (variables **A1-A4)**, as well as the assumption of utilizing these applications in the future (variables **B1-B4).**

The first part of the analysis is focused on distributing the relative frequencies of using ICT tools in SMEs in the Czech-Polish border area in the second half of 2012 in %. The results are shown in Table 1.

In the Czech border area, the first level is used the most (L1) – Simple Office ICT tools with 97%, followed by the second level supporting the management of the sub-processes (L2) in 93% of the SMEs. The third level - Comprehensive ICT tools of MIS System (L3) are used only in 62% of companies and BI ICT (L4) are supported in 42% of SMEs. In the Polish border area, ICT tools of L1/L2/L3/L4 levels are used in 97% / 93% / 56% / 28% of SMEs. The first two levels are comparable between regions, but the use of integrated MIS and BI are in the Czech border area significantly higher by about 6% and 14%.

In terms of future development in ICT tools used in both border areas, the use of Simple Office ICT tools assumes the same level, but in the case of ICT tools for the sub-process analysis in SMEs there is stagnation in the Polish region and a slightly increase of 3% is expected in Czech SMEs. On the other hand, it is beneficial planned to increase of ICT using for L3 (a comprehensive MIS) by 10.2% and 5.6% in the Czech and Polish SMEs, respectively. This trend is also detected for of BI tools (by 18.4% in the Czech SMEs and only by 8.3% in the Polish SMEs).

The above results show a considerable interest in and expansion of the use of BI applications.

Another issue of interest includes part E of the questionnaire "What are your preferences in software procurement?". This section offers the respondents four answers, as shown in Figure 2. Out of 96% of valid responses on the Czech side and 56% of valid responses on the Polish side, the evaluation was carried out for the entire region, as well as separately for the Czech and Polish sides.

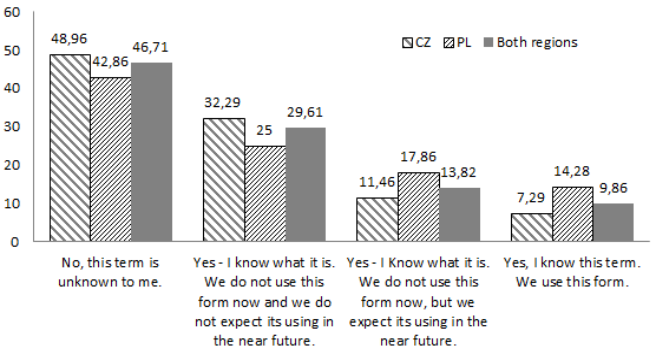

Fig. 2 Empirical distribution of the knowledge of the cloud technologies

The questionnaires about confirmed the expected lack of awareness of managers of what Cloud Computing (CC) is to offer. The correlation between the company size and the

TABLE. I:
EMPIRICAL DISTRIBUTION OF THE USE OF ICT TOOLS IN THE SURVEYED REGIONS

		Valid percentage frequency of using contemporary and future ICT tools							
region	**ICT usage**	**A1**	**B1**	**A2**	**B2**	**A3**	**B3**	**A4**	**B4**
CZ	rarely	3.0	3.1	7.0	4.1	38.0	27.8	57.6	39.2
	often or continuously	97.0	96.9	93.0	95.9	62.0	72.2	42.4	60.8
PL	rarely	3.3	2.3	6.7	6.8	43.9	38.3	71.9	63.6
	often or continuously	96.7	97.7	93.3	93.2	56.1	61.7	28.1	36.4

knowledge of the term CC is a weak, blat statistically significant.

IV. Business Intelligence Tools And Competitive Intelligence, Cloud Computing

BI is system of tools, design solutions and organizational measures to enable the organizational management based on knowledge. These tools have been increasingly applied in companies worldwide. They are specifically aimed at supporting the needs of managers. They form a part of the overall company IS that works with selected or modified data, and that uses these modifications to become the bearer of comprehensive information characterizing the relevant processes in the company. Primarily, they are used to identify and locate specific phenomena in the company, and subsequently to perform their in-depth analysis. An area of BI consists of a number of separate components, with its own architecture and methodology [4].

Many case studies confirm that BI may be utilized in an organization for:

- Increasing the effectiveness of strategic, tactic and operational planning including: modelling different variants in the development of an organization; informing about the realization of enterprise's strategy, mission, goals and tasks; trends, results of introduced changes and realization of plans; identifying problems to be tackled; providing analyses of products, employees, regions; providing analyses of deviations from the realization of plans for particular organizational units or individuals;
- Creating or improving relations with customers, mainly: adequate knowledge about customers for sales representatives so that they could promptly meet their customers' needs and identifying market trends;
- Analyzing and improving business processes and operational efficiency of an organization.
- Providing knowledge and experience which emerged while developing and launching new products onto the market; providing knowledge on particular business processes. [5].

The BI applications use the "OLAP" (On-Line Analytical Processing) technology and Data Mining for advanced analyses. Data Mining allows searching of correlations in large volumes of data, which were not known in advance. The ultimate goal is to provide readable, well-organized, analyzable and readily available information from the maximum number of corporate databases and external sources, which can be utilized in the management [6].

CI represents a set of following activities: definition, collection, analysis and distribution of information and knowledge about clients, competitors and other aspects of the external environment surrounding the organization. These activities are carried out in order to reduce the risk of threats from external business environment, mapping potential opportunities and reaching competitive position.

If we ask ourselves the question what difference there is between CI and BI, the correct answer is that the difference is not very significant. The basis for this assertion is the understanding of the meaning of "intelligence" as the ability to use knowledge assets in action. In our case, these actions relate to the strategic management of an organization.

Thus, the CI only represents another development step, introducing into management sophisticated working methods in connection with the development of advanced technologies for contextual search in external information sources throughout the Internet.

CC is sharing HW and SW means via networks, changing the traditional IT processes and business models. It allows a more efficient use of computing and other data center sources and service providers and brings users to meet their requirements for the speed of the deployment of services, their quality and availability at a transparent price [4]. As already stated above, CC is based on virtualization. Storage, servers, applications and desktops are separated from the actual physical information infrastructure of the business. Virtualization enables greater efficiency and flexibility of IT while reducing IT costs. CC also brings benefits and risks. Benefits of CC:

- The applications or services are provided from centralized data centers through a network, thereby eliminating the software management on each PC.
- Users are not required to know the technology, nor manage its operation on their own. Access to applications and data located on a server is facilitated through a web browser (SaaS - Software as a Service).
- HW can also be provided as a service (IaaS - Infrastructure as a Service). The same applies to the computing platform (PaaS - Platform as a Service).
- Dynamically scalable resources and elasticity.
- Reducing financial costs; the provider supplies the product to multiple users (multitenancy).
- CC changes ICT to a service. Computing power becomes a commodity that we buy and scale as needed.

Limiting factors of CC:

- A possible risk of failing to maintain permanent operation of IT via the Internet – reliability.
- Increased costs for the transfer of large volumes of data.
- Concerns about the security of sensitive data and data in general.
- Lack of control over one's own data, valuable data located off the company.
- Problems with managing permissions and roles with growing company portfolio of CC applications.

A very important contribution of CC for the customer is the transfer of risk and responsibility to the service provider. The supplier is responsible for implementation, audit, security, monitoring, necessary capacity plan, maintenance and support, as well as for availability management.

By using the CC, one can solve the problem of SMEs - lack of availability of many ICT due to their prices and the required infrastructure. In the current economic situation,

CC offers SMEs a viable solution to secure access to the necessary technologies [7].

Currently, CC services offer on-line provision of virtually all software products that can be virtualized into the cloud.

Users no longer have to worry about the management of applications, servers and computer networks and can focus on selecting the range and quality of services purchased from the provider, measuring their use and the prices they pay.

V. Conclusion

A company's global strategy is currently an active strategy. Its quality is dependent on the support of the existing IS. If the IS/IT are well designed and used, they may affect the company's competitiveness. The goal is an interconnection between the development of the information system and the global strategies of a company or an institution [8].

The ICT has become a necessary tool for enterprises, public administration and citizens in most countries. Good strategic management of companies and institutions is conditional upon continuous IS management and maintaining its integrity.

In EU-25, there are approximately 23 million SMEs, representing 99% of all EU companies and providing jobs to approximately 75 million people [9].

The significant role of SMEs is certainly beyond any doubt. It is the ability to respond quickly to changing conditions or absorb free labor that is seen as irreplaceable. SMEs struggle to gain access to capital. This problem persists despite the fact that commercial banks in recent years show a growing interest in these otherwise risky clients that mostly want relatively small loans. The above suggests that capital-intensive investment in ICT is often not a priority for the management of these companies [10].

Changes in company strategy and processes require changes in hardware, software, data storage sites and telecommunication equipment. The quality of business processes is often dependent on the capabilities and features provided by company IS.

Sufficient amount of information nowadays becomes the key factor for success in all fields of human activity. However, obtaining information as such is not enough; they must meet certain parameters. Valuable, meaningful piece of information is one which is provided at the right time and the right place, which it is relevant, correct, complete, and meeting many other requirements.

Projections suggest that in the next decade, we should expect a very rapid development in conventional as well as unconventional approaches to IT and information processing. Possible results are not attractive only in terms of technology, but they can significantly contribute to cost savings and increased productivity in all areas of business and management [11].

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