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STRATEGY OF KNOWLEDGE AND INTELLECTUAL CAPITAL MANAGEMENT

Abstract: The article presents evaluation of the condition and possibilities of developing and implementing the knowledge management strategy in Polish organizations with the use of intelligent IT solutions and tools. The key role of intellectual capital and intellectual assets has been emphasised. Much attention has been paid to the methods and tools of identifying and meeting information-related needs of decision-makers at all management levels in organizations in the period of economic slow-down. The urgent need of implementing a cohesive analytical environment and a non-investment service model of IT solutions and infrastructure functionality, including Cloud Computing and Software-as-a-Service has been pointed out. Moreover, attention has been paid to the necessity of developing and implementing strategies of the competent intellectual capital use of analytical outcomes in business processes.

1. Development and management of knowledge and intellectual capital in the organization

Knowledge management and intellectual capital development are unquestionable, optimal investments at the time of economic slow-down, i.e. the recession. Numerous publications and studies[1] show that knowledge management and, consequently, intellectual capital management keep worsening in organizations in Poland (especially those bigger) and it has reached the edge of chaos. According to KMPG International and their Polish Division, more than 70% of Polish organizations are not linking knowledge management with their strategy, setting strategic goals and achieving these. Knowledge is applied informally in organizations' operations, occasionally and randomly. None of Polish organizations analysed by KMPG has reached the level of systematic integration of knowledge management with either current or long-term activity. This situation is caused by the absence of knowledge management strategy and the lack of rules and procedures of collecting, creating and using knowledge in organizations in a rational manner.

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[1] For more information see: [Kubiak 2004, 2006, 2007].

What is worse, most organizations do not implement or apply dedicated analytical tools (see also [Gontarz 2009]). Both the theory and the experience of many European organizations show that managing and using knowledge skilfully they increase their competitive advantage, prestige, economic efficiency and value for the customers.

According to KMPG experts, managing knowledge by means of organizational and IT tools (analytical tools mainly) increases the productivity and the profitability of developments effected with the participation of organization's own capital by a dozen percent or so in terms of ROCE indicator (Return on Capital Employed). Thus, investing in innovativeness and developing the intellectual capital is not only profitable, but necessary to gain the competitive advantage. This opinion applies mainly to the sector of small and medium-sized enterprises, where – contrary to bigger organizations – intellectual capital development plans or business informatization strategies are developed much less frequently. They keep focusing on purchasing hardware and software without pre-defining their real information-related needs at all (strategic, tactic and operational) management levels and for all management functions (marketing, sales, production, procurement, finance, etc.).

According to experts, the sector of European SMEs is characterized by the absence of any vision or reflection over using analytical tools in business effectively or regarding information and knowledge as strategic and competitive assets. To improve this situation, IT needs to be integrated with business, beginning with identification of businesses information needs.

2. Managerial information needs

Correct informatization of an organization requires one to develop three strategies at a time: business strategy, information system (IS) development strategy and IT application strategy. Consequently, developing, implementing and using IS and analytical tools should be linked tightly to setting and achieving business goals, tasks and strategies. Information is the element connecting these strategies, and to be more precise, connecting IT with business. To develop and implement business strategy, one needs IT to provide information-related services and cross-organizational knowledge (activities of the organization and its environment)[2]. The position and prospects of IT in the period of economic development slow-down are increasingly endangered and limited in a rigorous manner. IT is not the only tool used to satisfy businesses' information-related needs any longer. Managers use other media and means of communication more and more often, in order to obtain information faster, more effectively and at a lower cost. This creates a challenge to applicability and advisability of investing in IT solutions and additional (mainly

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[2] For more information see: [Andreu, Ricart, Valor 1992; *Strategia informatyzacji…* 2003, p. 26; *Strategie i modele…* 2008].

analytical) tools. More and more is expected of IT systems, as a result of diversity of information-related needs of the strategic, tactic and operational levels. To achieve strategic goals, one needs cross-sectional, integrated information based on a long--term approach and obtained from external sources mainly. On the other hand, information from organization's internal sources and from its integrated information system (IIS) prevails in case of operational goals. Managers and users of IIS make defining and meeting information-related decision-making needs more difficult themselves, as they not always want to and can specify their information-related needs, their scope and structure. This fact is often used to justify unsuccessful development or implementation of IIS or failures of integration of IT solutions and tools with organization's development strategy approached too generally or services and functionalities specified in an imprecise manner and perceived from the technical and engineering point of view instead of the managerial approach.

Managers' reluctance to use IT services and their inability to see the nature of information and to read it correctly is another problem which makes integration of IT with business and satisfaction of information-related needs difficult. But this problem originates beyond the functionality and utility of IT applications and tools that have been implemented. How it will be solved depends on competence, intelligence, knowledge, skills and personal qualities of the organization's intellectual capital. There is no doubt that even IIS will not provide entirely useful information for decision-making and consequently, it will not ensure selecting a solution and a mode of acting which will be optimal in the given circumstances. Even BI class systems with analytical tools provide information which first needs to be understood, interpreted and evaluated by the managers in terms of their objectives and thereafter – transformed into knowledge about possible and desirable methods of acting and solving decision-making problems. Analytical tools make processing and multi-criterial analysis easier (data mining). But this does not relieve the intellectual capital from thinking, critical analysis, creative reading and using information adequately. These operations are not infrequently delegated to IT systems and personnel, which should not take place. IT personnel are not able to meet these expectations, as they do not understand or know the business and its needs better than managers, although they may suggest to managers what information an ERP-class IIS can and should provide. Thus, only common agreement on the time, type, scope and form of information to be obtained from the IIS and necessary to create business may spur investing in innovative IT solutions and tools.

3. Business Intelligence system in smoothing the crisis influence

Contemporary ERP class systems provide multi-sectional information about business processes and events. Nevertheless, they do not provide integrated information which would combine data from various modules. Neither did these systems prove themselves in the role of analytical tools that would enable dynamic

reporting subject to further exploration. These functions are performed by BI systems integrated with the organization's existing IT infrastructure[3].

The practice associates BI with concrete IT system tools (mainly analytical) supporting decision-making processes of the organization. Users of BI systems expect integrated, cohesive and up-to-date information about organization's business processes and condition. But the main purpose of implementing BI systems is to improve decision-making processes by more precise planning, reacting to changes in the organization's surrounding in advance and making concrete decisions in key areas of the business. Moreover, the users expect that BI systems will enable them to translate strategic goals into operational targets for company's individual organizational units. The eventual aim is to facilitate understanding the objectives and identifying oneself with them in the course of achievement. Besides, BI systems may anticipate the variability of data in the knowledge base. Real-time analysis of these data should enable one to spot new tendencies before they emerge in the environment and consequently – to minimize the risk of making wrong decisions. This applies mainly to larger and medium-sized organizations, where managers do not keep up with information changes and do not absorb key information. BI systems work well also in those organizations, where constant and rapid changes make it impossible for the top management to take a holistic view of the entire situation. One may overcome these difficulties by means of implementing Key Performance Indicators and assigning these to each business area, as well as by applying Enterprise Performance Management. These solutions define BI systems application, beginning from the strategic level of the decision-making pyramid, down to the operational level. In the economic situation we experience today, the financial pressure is becoming a priority of the organization's IT infrastructure management. But understanding the needs of business and choosing methods of meeting these challenges still remains the most important among the priorities. Investing in the IT infrastructure and managing its costs takes the third place only. Enterprise IT Management (EITM) system has been designed for this purpose. It facilitates IT managers and departments efficient and effective provision of services for the business, supporting also the evaluation methods and the process of acquirement, even if only by means of outsourcing. The worsening economic situation and intensified competition are changing IT's role and importance in the organization. It is becoming more business-oriented and acts as a bridge between business requirements and organization of IT. Business is expected to articulate decision-related information needs, while the IT management is required to understand IT activities and investments through business profits. EITM ensures the possibility of comprehensive arrangement of problems in the field of IT department and infrastructure management according to business needs.

The system covers three areas:

1) strategic management of the IT department and investments in IT infrastructure according to legal acts regulations,

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[3] For more information see: [Kubiak 2009].

2) project and project portfolio management,

3) operational management covering current control of the IT infrastructure and information security in the organization.

Using BI analytical technologies and systems may ensure that the organization will gain the expected benefits, on condition that analysis outcomes are used systematically in controlling processes relevant in terms of functioning of the organization and business goals adjustment adequate to changes in the organization's environment.

4. Barriers of Business Intelligence system implementation

Implementation of BI system in medium-sized and large organizations – unlike small companies – is most frequently caused by the fact that managers do not know the key data, therefore organizations carry out a detailed business analysis and review their business goals prior to implementation as a rule. These activities lead to formalization of the productivity management process, developing models of processes and indicators. The organization faces the need to find out:

1) what data it has at its disposal,

2) what data is most desirable for the organization to achieve its goals,

3) what data are unobtainable or hardly available.

Thereafter, analytical tools and licences available in the organization are analysed and respective needs are identified. These needs are determined with reference to the organization's mission and strategy, the integrated information system which more and more often includes ERP system with budgeting, ABC, balanced scorecard, CRM, SCM, a system of KPIs and other components. This is how the organization is able to adjust indicators to its strategic goals indicated by the top management and to translate them into the system of reporting and visualizing the efficiency of activities.

It follows that the BI system has to be adequate to the organization's needs, verified (test of BI model accuracy, credibility and utility) and implemented correctly, i.e. tailored. Usually, business requirements, functionality and architecture of IT systems in the organization are taken into account here. Nevertheless, the organization's intellectual capital performs the principal role here, as it has to learn using modern IT solutions, including BI systems, in providing information-related services to the business and in creating innovative and competitive products and services. This is the way how the intellectual capital creates intellectual assets, i.e., the base of customers and relations with them, innovative, modern, high-quality products and services, efficient and productive business processes and operational processes, employees' unique competence and skills, motivation and commitment. The organization's ability to create and use intellectual assets efficiently is becoming more important than investments and material assets management, as these account for as little as 10-15% of the organization's market value only [Face 2009]. A non-

-investment service model of IT solutions functionality and IT infrastructure is playing an increasingly important role in creating organizations' intellectual assets. Organizations are reducing outlays on IT in exchange for a fixed fee-based use of Cloud Computing and Software-as-a-Service.

5. Cloud Computing and Software-as-a-Service model

Cloud Computing and Software-as-a-Service model makes implementation of IT solutions and provision of information-related services much easier within organization's own IT infrastructure and environments. The model consists of the following components:
1) business software,
2) group work supporting tools,
3) developers application platforms,
4) data storage and document circulation services,
5) computing capacity rent services.

6. IT infrastructure and environment management

According to the research by IDC and Gartner, IT management services and solutions represent the most commonly used form of Cloud Computing model, which is applied in 26% of the organizations covered by the survey. Group work supporting tools are used by 25% of organizations and services of developers implementation platforms – by 17% of the organizations [IDC... 2009].

Besides facilitating and simplifying implementation of IT solutions, Cloud Computing reduces organizations' demand for their own SI/IT competence, offers convenient forms of payment for using such solutions, guarantees simplification of IT infrastructure and environment standardization processes, enables easier access to the latest techniques and functionalities of IT systems.

But Cloud Computing model causes also some blocks, restrains and barriers in terms of information security, productivity and availability. Low organizational culture, psychological barriers and habits (and mainly – the fear of losing the position, the prestige and the competence, as well as ignorance of the law regulations) make popularization of Cloud Computing model difficult. These barriers can be partly eliminated by enhancing the organizational culture, as well as by developing, implementing and observing procedures.

7. Analytical environment in business processes

Creating and implementing a cohesive analytical environment correctly offers not only new opportunities of obtaining trustworthy, timely and verifiable information and meeting information-related expectations and needs of various users. It also

makes it easier to achieve and strengthen competitive advantage through a deeper insight and understanding of the organization's situation and undertaking a successful attempt of envisaging its future, future circumstances of operation, markets, clients, products and services to be offered.

But to be able to use advanced analytical methods and tools, one needs to:

1) locate them adequately in the existing business processes by means of modifying them and adjusting to organization's individual needs,

2) integrate the systems functioning in the organization in order to provide information to various users due to:

a) preparing adequate data structures dedicated to analytical application (following cleaning and transfer),

b) designing a process of building analytical models,

c) creating a starting environment for scoring generating models.

Implementation of a cohesive analytical environment – analytics in short – begins with selection of business processes which require a certain improvement and analytical support. This requires transition from the business language to the language of analytics, close co-operation of the business world with analysts.

The next stage of implementing a cohesive analytical environment is to create an environment where data for data mining analyses will be prepared. This stage includes building a repository of analytical data (this consumes 60-80% of the implementation time) – an intermediate link between the data warehouse and a flat analytical table. The analytical table includes historical variables, computed and used in Data Mining analyses directly (model construction, verification and scoring), while analytical tools (e.g. data warehouses, transactional databases) require co-operation with data mining through analytical data repositories. Data repositories are created because of:

1) integration of data from various, dispersed sources (also other than data warehouse),

2) various forms of data being stored (e.g. computed variables taken over from other sources than source systems),

3) initial aggregation of data,

4) uniformization of various data levels,

5) extended time horizon of collecting (historical data) and processing analytical data (more: [Głowiński 2008]).

The environment in which data are prepared should be flexible and provide for up-dating the existing data, adding new data and deleting redundant data. On the other hand, data placed in the flat analytical table should not originate before the zero date (the date of table building), as this would distort the stage of analytical model scoring.

The process of building analytical models begins after the environment for preparing data for data mining analyses was created and it follows the methodology of the given provider of data mining analytical solutions.

The process of modelling includes:

1) preparing test data for building the analytical model,

2) data modification (real data missing, non-standard observations, variables computed as an effect of basic variables transformation, and other),

3) selecting key variables,

4) selecting an optimum model (for the given conditions),

5) model visualization and integration (coming back from the language of analytics to the language of business).

Tools for data mining analysis are selected on the basis of such criteria as: recommendations of companies evaluating the market of analytical software, the availability of latest and proven algorithms, the availability of efficient interfaces to the organization's sources of data, the tool's compliance with the hardware platform being used, the facility of using the tool, the facility of using analytical outcomes.

The environment of generating scorings in the analytical mode or manually on user's request is another element of the analytical environment. The scoring environment should include mechanisms for monitoring data correctness and models effectiveness. The point is not to use analytical outcomes generated with the use of incorrect data and ineffective models. Analytical outcomes generated by the model are regarded as transitory, therefore they are subject to filtering and sorting according to the criterion of business activities selection (e.g. supporting marketing actions). Model monitoring, i.e. counting selected indicators of model effectiveness and stability in time are also to be considered. This is how one can check whether the results generated by the model and business activities based on them are correct. But the effective model does not always ensure effectiveness of business activities, even if only because of the model getting older as a result of changes in the environment and inside the organization. This is why the model needs to be refreshed on a continuous basis.

Analytical models management is the last stage of implementing a cohesive analytical environment. It is affected by means of the model management software, which is used all through the model life cycle – from the moment of its development, through testing, operation in production, until withdrawal from use and filing. Formalizing and controlling all stages of the model lifecycle, the organization impinges on what happens to the models, who decided to use the model, who, when and why launched the analytical model.

It follows from the considerations presented above that the fact of implementing the analytical environment and using the outcomes generated by models in the organization's activity influences business processes significantly. But the practice shows that developing the model does not translate directly into solving business problems. It is necessary to develop the strategy of how analytical outcomes are used in business processes by the organization's analytical capital and to implement this strategy effectively. For analytical models to be used in the organization efficiently, their users need to be trained on a regular basis and communication needs to be

improved. To provide this, workshops are organized where experienced personnel explain the form and the methods of using analytical outcomes to model users. Such activities are particularly important for those users who do not find investing in Business Intelligence convincing or analytical outcomes useful. Not infrequently model users do not understand the analytical outcomes and they therefore do not want to explore the functionalities of analytical tools or use them in business processes.

8. Conclusions

The process of solving business problems at the time of economic slow-down can be supported effectively by means of specialist IT tools and analytical solutions, especially Business Intelligence class systems which include warehouses of data and documents, ensure immediate access to large sets of data and the possibility of transforming these according to managers' needs. Usually, three groups (pillars) of tools are distinguished in BI systems. The first group includes those turning out particularly useful – manager cockpits used for making KPIs available and OLAP (On-line Analytical Processing) cubes enabling report exploration. The second group is dominated by statistical and mathematical tools and by artificial intelligence methods designed for revealing knowledge among data collected in data and document warehouses. These tools are classified to data mining, i.e. data exploration. The last group of BI tools is used for seeking the best business solutions, i.e. for optimizing activities. Activities can be optimized by means of using data and any incorrectness found in them. To implement BI systems and use them efficiently, a considerable time input is required at the designing stage and assumptions made at the pre-implementation stage need to cover the impact of various factors and persons who will be influencing the organization's future activities. Successful development, implementation and use of BI systems in business are determined by the intellectual capital, its awareness, competence, motivation, intelligence, knowledge and expertise. The organizational culture and precise knowledge of information-related needs at all levels of organization management are also relevant.

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