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## **A CONCEPTUAL MODEL OF THE ICT SUPPORT FOR INTELLECTUAL CAPITAL MANAGEMENT**

**Abstract:** The article aims at presenting how to apply information technologies to support intellectual capital management. At the very beginning intellectual capital and its management are both characterised. Then application of information systems and technologies is shown in the context of intellectual capital sources and objectives of intellectual capital management. The final part of the article focuses on the role of corporate portals in intellectual capital management.

### **1. Introduction**

Information and information technologies play a major role in the contemporary economy that is characterised by globalisation, dynamic economic phenomena, fierce competition, time pressure, customer orientation, creativity and growing complexity of management processes. Both information and knowledge have become the most valuable asset of an enterprise, and thus decide the value of an enterprise, its position on competitive markets and its development. If knowledge and intellectual capital are to provide a source of competences, strength, wealth, competitiveness, effectiveness, efficiency and productivity, effective management of knowledge and intellectual capital is necessary<sup>1</sup> [Skrzypek, 2005]. It is possible to deal with new challenges due to information technologies and new generations of information and decision systems including, for instance, Business Intelligence

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<sup>1</sup> Knowledge management is defined in numerous ways. It is perceived as a process, system, independent scientific discipline, and new philosophy of management or even art [Grudzewski, Hejduk, 2002]. Knowledge management may be referred to as a fundamental change in the management of an enterprise and the change involves effective utilisation of all resources other than the tangible and financial ones, i.e. intellectual capital. Taking the role of intellectual capital in knowledge management into consideration, it is necessary to assume that knowledge management is a set of principles, procedures, methods and systems that involve creating, accumulating, protecting, disseminating and utilising intellectual capital of organisation [Strojny, 2000].

Systems [Olszak, Ziemba, 2006] and knowledge management systems [Grudzewski, Hejduk, 2004; Firestone, 2003; Kisielnicki, 2004; Kubiak, 2004] or integrated information platforms including, for instance, corporate portals [Olszak, 2004; Sullivan, 2003; Ziemba, 2007].

## **2. Intellectual capital management in an enterprise**

Intellectual capital in an enterprise consists of diversified components. The most important component includes patents and other intellectual assets that are legally protected, practical experience, skills and knowledge of the whole enterprise and its individual employees, elaborated technologies, models, methodologies and tools, along with good relations with employees and customers [Bratnicki, Strużyna, 2001; Edvinsson, Malone, 2001; Skrzypek, 2005a; Stewart, 1997, Strojny, 2000a]. Therefore, intellectual capital may be understood as a sum of knowledge that individuals who make up a particular community have along with practical transformation of the knowledge in question into components of the enterprise value [Bratnicki, 2000].

Intellectual capital comprises of individual (human) intellectual capital and structural intellectual capital. Human capital refers to particular employees and their knowledge, skills, abilities, practical experience and creativity. Human capital involves competencies and mental patterns of employees.

There are two forms of structural intellectual capital in practical management of intellectual capital: organisation capital and relation (network) capital. The former refers to intellectual property, concepts, patents and trademarks, processes and methods of work, procedures, databases, information technology and communication related infrastructure. It is also necessary to pay some attention here to corporate values, culture and philosophy. The latter stems from external relations of an enterprise. Relation capital is made up of structures that are used to maintain appropriate relations with the environment including sales and co-operation networks, research and development projects, knowledge on customers and business partners, brands, image and reputation of organisation, strategic partnership, etc. Structural capital value is multiplied due to customer loyalty, market potential and know-how of suppliers, customers and business partners. Such capital is supported by creating partnership, establishing inter-connections with the environment, undertaking economic co-operation and building chains of values.

It is suggested that social capital is an important component that permeates intellectual capital. Due to social capital it is possible to solve social problems, regulate mechanisms of local community interactions and develop economic entrepreneurship more effectively [Coleman, 1988]. Social capital as compared to human and structural capitals is the most difficult to capture (identify). Such capital is manifested in interpersonal relations, social standards and trust along with loyalty. These informal values that are accepted and approved by individual employees and teams (intra and inter-organisational) support co-operation and co-or-

minated actions within business processes along with the generation of value added in an enterprise.

The research conducted allows for stating that enterprises utilise from ten to twenty percent of possessed knowledge and from ten to fifteen percent of intellectual capital enjoyed [Skrzypek, 2005]. Therefore, the foundations of wealthy and successful contemporary enterprises are to be found not only in their intellectual capital, but first of all in effective and efficient management of intellectual capital that is skilfully combined with tangible and financial capitals. This is the only approach that enables enterprises to create and maintain a market leader position. However, the very process is incredibly difficult and requires a holistic attitude to intellectual resources that are utilised to increase enterprise value.

Intellectual capital management involves undertaking actions that deal with basic functions of management and that are oriented at all components of intellectual capital in order to achieve objectives set by an enterprise efficiently and effectively [Maksymowicz, 2002]. Due to the intangible nature of intellectual capital, enterprises have to face a problem of accommodation while realising traditional functions of management with reference to the capital in question. As a result enterprises may expect the following benefits [Skrzypek, 2005]:

- increasing the value of intellectual capital;
- ensuring development, maintaining and securing intellectual resources and knowledge in organisation;
- promoting knowledge generation and introducing innovations by every employee;
- defining requirements referring to knowledge, experience and qualifications on the basis of strategies adopted;
- accumulating and disseminating knowledge in the appropriate time and among appropriate employees along with appropriate authorities and requirements;
- utilising knowledge accumulated so far;
- applying knowledge to plan and realise objectives and tasks;
- eliminating possibilities of making the same mistakes again;
- promoting innovations;
- utilising tangible and financial capitals in a more effective way;
- adjusting trainings to enterprise needs in a more effective manner;
- modifying activities undertaken by an enterprise, its restructuring that results in better knowledge utilisation, minimisation of knowledge deficiencies and knowledge development contributing to the generation of product value added; and
- managing, creating and controlling potential knowledge in order to use innovations, results of research and development or strategic alliances.

To enjoy the benefits mentioned above, it is necessary to employ information technologies (IT) and information technology systems whose major task is to support intellectual capital management.

### 3. Information technologies in intellectual capital management

Intellectual capital is directly connected with sources of knowledge in organisation. Such sources may be used to develop a conceptual model of information technology systems that support management of intellectual capital. From the information technology point of view, it is important to demonstrate external and internal sources of intellectual capital (Figure 1).

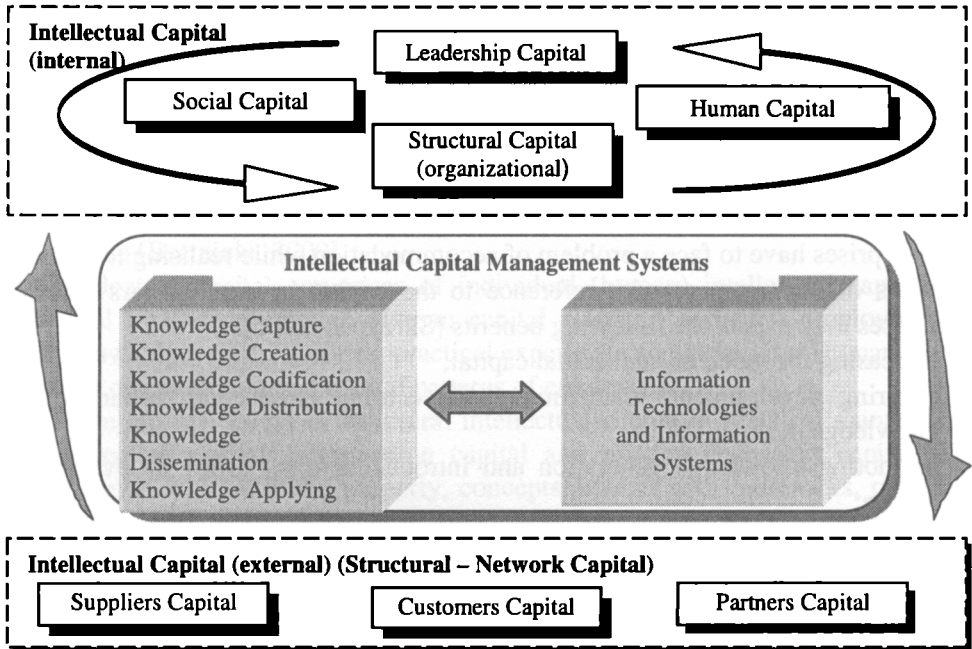


Figure 1. Position of information technologies and information systems in intellectual capital management

The major internal sources of knowledge in organisation include human capital (leadership and manpower capitals), social capital and structural capital. It is important to distinguish between leadership and manpower capitals because of the roles and tasks undertaken by managers and their employees. Managers define business strategies including a strategy of knowledge management. Working in the rapidly changing environment they motivate and encourage their employees to create values and innovations, to share knowledge, to take risk, etc. The role of leadership capital is manifested when organisation succeeds on the market and other organisations that function in similar material conditions (finance, contracts or technologies) lose their market share or even collapse. Organisation success also stems from manpower capital. Employees store organisation knowledge in their

own minds and that is why it is very important to undertake activities aimed at managing organisation employees and influencing their whole career tracks. Such actions involve employing, training, assigning to projects, motivating, assessing, promoting and finally terminating a job contract, if it is necessary. Communication and co-operation between employees, i.e. social capital, play a major role in creating knowledge environment. Social capital is connected with numerous issues including frequency of contacts, contents, tone, and communication channels selected by individuals, teams and the whole organisation. When employees and managers leave their organisation, it is structural capital that is left. Structural capital consists of information technology systems (databases and files), group work tools (manuals, documents or software) and business processes.

Network capital of organisation (capital of a value chain) is an external source of knowledge. The capital in question includes, first of all, customer capital that is defined as effective influence of information, knowledge and experience on acquisition, development and maintenance of a profitable customer portfolio. The most common measures of customer capital include customer satisfaction (services designed and delivered according to customer's needs) and loyalty (sustaining, coming back and referencing). Involving suppliers and other commercial partners in the process of creating values is also very important.

The Implementation of technologies that support intellectual capital management requires first of all:

- defining management objectives in particular forms of intellectual capital; and
- elaborating a map of information technologies and systems that support intellectual capital management in the context of pre-defined objective realisation.

As a result of the above approach, it is possible to determine some hierarchy of priorities while realising any venture that involves designing information technology systems of intellectual capital management.

Taking the development of intellectual capital into consideration, business strategies that are set by organisations should also focus on strategic objectives that are oriented towards the development of particular components of intellectual capital (Figure 2).

The development of manpower capital is related to the realisation of the following objectives: improving skills, acquiring new skills that are necessary to realise new business ventures, improving employment of new workers, reducing time necessary to perform routine tasks, facilitating contacts with experts, helping to reveal tacit knowledge and share tacit knowledge, etc. Similar objectives may refer to the management of leadership capital. However, the promotion of knowledge mission and strategy, denying rumours and trust building predominate here.

The development of organisational capital may require setting strategic objectives that refer to acquiring, organising and distributing of codified knowledge, revealing tacit knowledge of employees and teams, mapping business processes, supporting decision making processes by means of "just-in-time" information provision, etc.

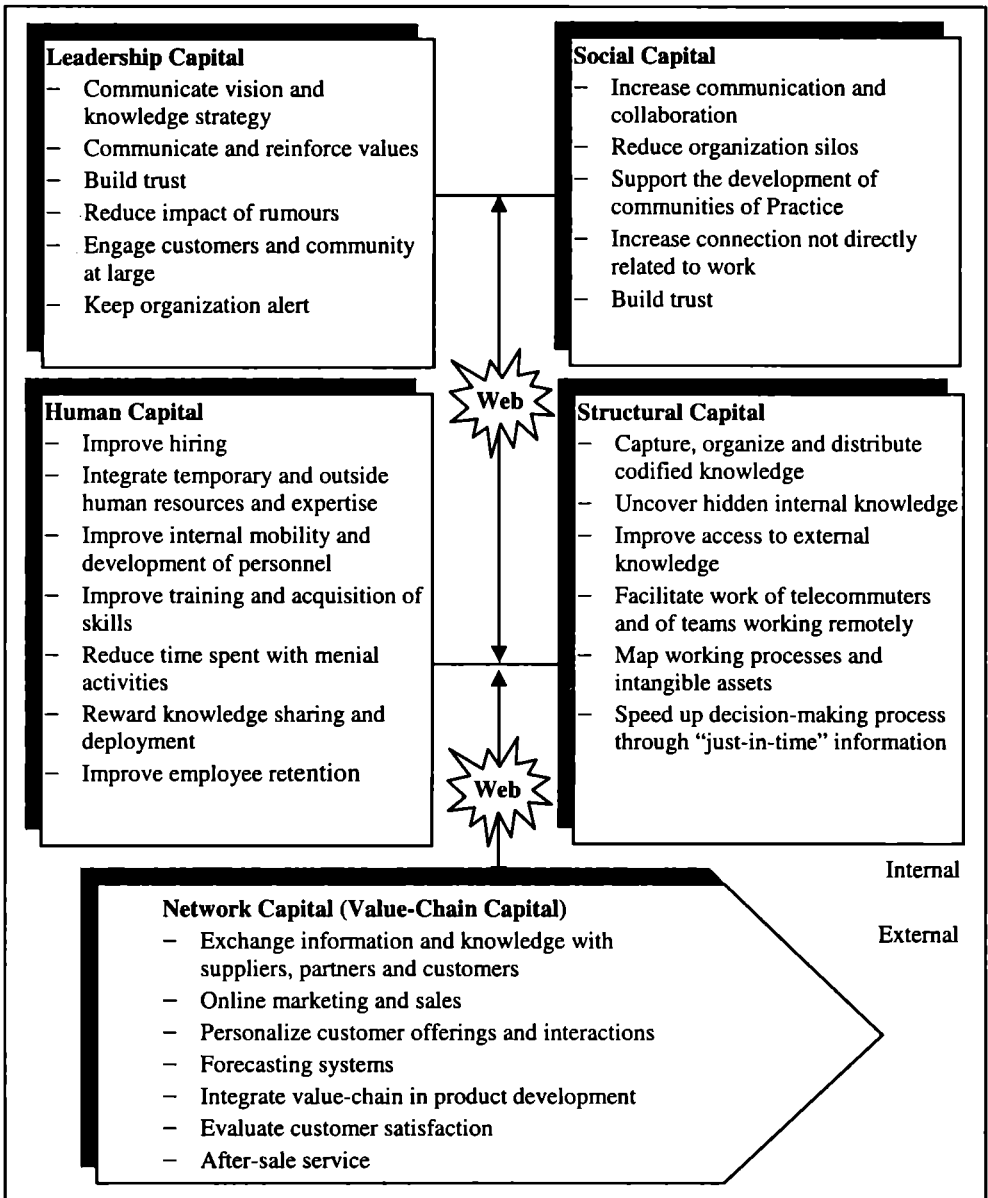


Figure 2. Sources of intellectual capital vs. intellectual capital management

Source: based on [Terra, Gordon, 2002].

With reference to the development of relational capital, it is possible to define the following objectives: exchange of information and knowledge with suppliers, part-ners and customers, integration of supply chain, assessment of customer

satisfaction and loyalty, and access to knowledge to be found in the Internet resources.

While identifying strategic objectives of intellectual capital management, it is impossible not to mention social capital. For instance, it is necessary to pay some attention to the development of the so-called communities of practice, increase in the role of relations that are not directly connected with work, the development of communication and co-operation, etc.

The realization of objectives set while managing intellectual capital requires effective information technology support. The most important information technology solutions that support intellectual capital management include the following (Figure 3):

- document management systems that allow for storing, classifying and searching for documents, and registering all document related work;
- workflow systems that support the realisation of procedures to be used while dealing with documents;
- workgroup systems that allow for free transfer and share of knowledge in order to provide employees with good communication that will contribute to the process of knowledge generation and transfer; it is possible to enumerate the following solutions here: sophisticated e-mail, calendars and schedules, remote access via the Internet and mobile phones, complex messaging and its instructions on how to handle the matter, defining and managing workflow;
- decision support systems, expert systems, Business Intelligence (BI) systems that allow management to obtain selected, condensed and analysed information and support non-routine decision making;
- intranet, i.e. in company network that is used by employees to take advantage of information profiled to their own needs;
- e-learning systems that are used to transfer knowledge including, first of all, solutions that allow for remote learning by means of computer techniques (video conferences and on-line discussions); and
- data warehouses, i.e. data repositories whose contents come from numerous sources; data repositories allow for formulating queries, creating reports, analysing resource utilisation and provide justification for strategic decisions taken.

It is obvious that individual information technology solutions do not conform to the requirements of intellectual capital management. The integration of tools and software is necessary. Every organisation has to select solutions according to already adopted criteria including, for instance, business needs, information technology platforms and tools in use, compatibility with other solutions used in organisation, balance of benefits and costs, user friendliness, easy maintenance, necessity to organise a technical team, etc.

Information technology systems that support intellectual capital management aim, first of all, at storing and ordering knowledge that may be found in different forms, disseminating the knowledge in question between users adequately to their

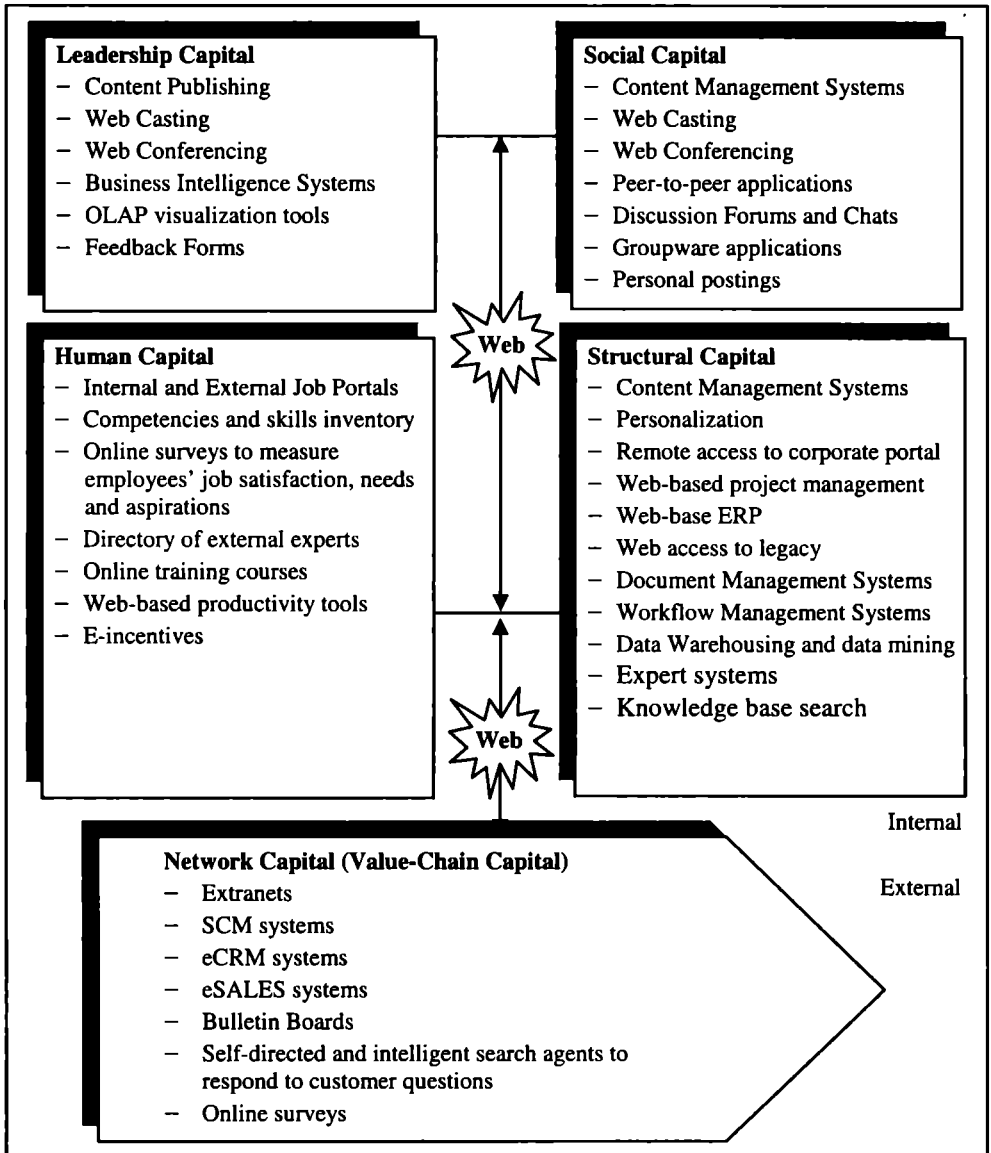


Figure 3. Sources of intellectual capital vs. information technologies and information systems  
Source: based on [Terra, Gordon, 2002].

needs and on the basis of their access authorities. As a result of applying such systems, there is better co-ordination of tasks realised and some increase in the utilisation of knowledge found in organisation, which contributes to improvement in the processes of reasoning and decision making. Finally, information technology



systems of intellectual capital management help organisations gain competitive advantage and largely influence a market position of organisation.

#### **4. Corporate portals in intellectual capital management**

Attempts at implementing information technology systems that support intellectual capital management in organisations frequently have to face barriers and they fail. Solutions introduced do not meet organisation requirements related to the management of intellectual capital. The failures in question may result from [Ziemba, 2007]:

- introducing a concept of intellectual capital management based on information technologies at the same time neglecting business related issues;
- no IT platform to be shared;
- mistrusting information technology security of intellectual capital management;
- no participation of users in designing information technology tools that support the management of intellectual capital;
- inertia in implementing information technology tools that support the management of intellectual capital;
- insufficient preparation of users to utilise information technology solutions that support management of intellectual capital;
- low usefulness and intuitiveness of information technology solutions that support the management of intellectual capital;
- low flexibility of information technology solutions that support the management of intellectual capital; and
- replacing interpersonal relations with technological contacts.

Many reasons of failures mentioned above may be avoided by integrating information technologies of intellectual capital management and by creating a homogeneous platform that is customised for individual employees, teams or the whole organisation and its environment. Such a challenge may be dealt with by means of a corporate portal concept [Terra, Gordon, 2003; Collins, 2003; Firestone, 2003; Koulopoulos, Frappaolo, 1999; Sullivan, 2004].

A corporate portal is an information technology platform that integrates information systems and technologies, data, information and knowledge functioning in organisation and its environment in order to enable users to gain personalised and comfortable access to data, information, knowledge and their sources adequately to needs resulting from tasks at any time and place in a secure way and by means of a unified (homogeneous) www interface. A corporate portal is therefore a point of access to organisation's "soft" resources and it provides an opportunity for modifying and completing the resources in question with new data, information and knowledge. Such a portal is a "gate" to knowledge in organisation.

A portal should interact with particular categories of intellectual capital. Depending on a target group that is an addressee of portal functionality such interactions may take the following directions:

- employee orientation, e.g. providing employees with the latest sources of information on an enterprise, its functioning and environment, ensuring co-operation and knowledge acquisition;
- management orientation, e.g. providing managers with analytic information and supporting decision making processes; and,
- customer, supplier and commercial partner orientation, e.g. enabling stakeholders to exchange documents, communicate, disseminate information on an enterprise and its products, etc.

The analysis of intellectual capital and areas of supporting intellectual capital management determines fundamental properties that characterise portals. The properties in question include the following [Ziemba, 2007]:

- integrating heterogeneous, structuralised and non-structuralised data that come from organisation and its environment;
- integrating heterogeneous applications;
- providing target groups with information by means of “push” and “pull” technologies through a unified web-based interface (www);
- providing target groups with personalised information and knowledge at any time and place, i.e. adjusting an interface portal to individual needs as far as the contents and physical appearance of the portal are concerned;
- verticalising portals, i.e. providing individual users and target groups with detailed information and knowledge on highly specialised sectors;
- creating opportunities for communication, information exchange and co-operation between individual users or user groups;
- categorising data, information and knowledge available by means of a portal; and
- publishing and distributing information and knowledge among target groups.

Corporate portals aim at integrating all data and applications in organisation to provide users (e.g. employees, partners or customers) with the results by means of one common interface. Such portals are supposed to provide employees with easy and rapid access to information and knowledge required while performing daily responsibilities, thus facilitating business processes, increasing work effectiveness and decision making. Corporate portals enable users to obtain easy access to information and knowledge accumulated in the whole organisation and its environment but they also provide direct contact and expertise-related assistance.

Functionality of a portal implemented in organisation is determined, first of all, by requirements set in the process of analyses carried out by target groups. This stage involves the following actions:

- analysis of intellectual capital resulting in thorough definition of areas related to intellectual capital management where application of the portal may bring about the highest business benefits or where potential benefits may seem less impressive;

- analysis of the information systems and technologies (already existing and being planned) from the perspective of supporting intellectual capital management along with possibilities to implement such systems and technologies in a particular portal; and
- analysis of portal target groups, as a result of which portal users, their roles and authorities are identified.

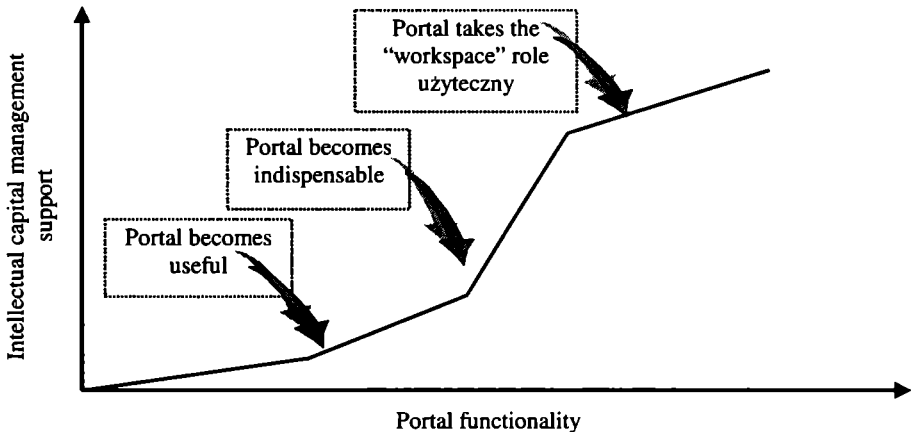


Figure 4. Role of the portal in intellectual capital management

Source: based on [Juda, 2002].

The above approach results in defining portal functionality that subsequently decides about the role of a portal in intellectual capital management (Figure 4). Functionality development helps the portal move from its role of being useful to the role of being indispensable. In case of ultimate functionality portals may become a solution that takes over employees' and managers' roles. It is necessary to note down here that some increase in the role of a particular portal is translated into its growing business value.

## 5. Conclusion

Although information technology is only one of components that make up intellectual capital, it is very important for organisation to understand information technology potential and to select appropriate solutions. The convergence of selected solutions within a corporate portal is another challenge.

Nowadays, the latest generations of corporate portals are more and more sophisticated from the perspective of integrating applications and resources, thus involving ERP systems, BI systems, content management systems, categorisation and taxonomy tools, search engines and applications in co-operation and communication. As a result corporate portals may exert more influence over the way orga-

nisation creates, stores, access and utilises knowledge. However, some attention has to be paid to the fact that only preserving equilibrium and adequate proportions between information technologies and strategies of intellectual capital management, corporate culture and processes would allow for transforming information and knowledge already possessed and knowledge to be acquired by organisation into new quality of functioning [Ziemba, 2007]. Technology cannot replace manpower, corporate culture or organisation strategies but it has to perform an auxiliary role.

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