

Intellectual Capital Statement – Made in Germany – and Mass Customization

R. J. Freund

Finkenweg 6, D-35099 Burgwald, Germany

E-mail : info@RobertFreund.de Tel : +49 6451 71290

M. Piotrowski

University of Information Technology and Management

ul. Sucharskiego 2, 35-225 Rzeszow, Poland

E-mail : mpiotrowski@wsiz.rzeszow.pl Tel : +48 604 600883

Abstract

Traditional factors of production, like natural resources, labor and capital have lost significance. At the same time the importance of intangible inputs, like information and knowledge, increased. Nowadays if one talks about knowledge it refers to the Intellectual Capital of enterprises. Already today the part of the production factor knowledge is estimated to account on average 60% of the total value creation of the enterprises with increasing tendency. The stronger focus on intangible assets has also an influence on Mass Customization. Up to now the economical aspect of Mass Customization has been mainly measured by means of traditional accounting methods. However, in addition to this aspect, it is important to ask what contribution Mass Customization may have on the development of the Intellectual Capital of an enterprise.

Keywords: Intellectual Capital Statement, Knowledge Management, Mass Customization

1. THE INTANGIBLE ECONOMY

1.1 Introduction

In the past decades our production process has changed. Traditional factors of production, like natural resources, labor and capital have lost significance. At the same time the importance of intangible inputs, like information and knowledge, increased. This shift in significance from tangible to intangible factors of production however, did not lead to changes in the traditional accounting and measurement systems [1].

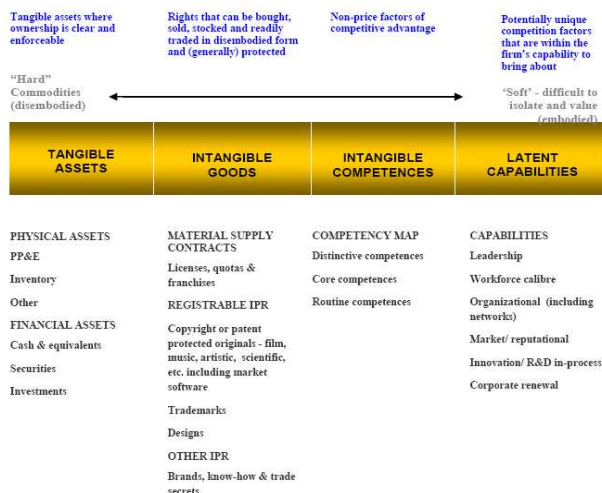


Figure 1: The resource base of the 21st century enterprise [2]

In a mass-production economy with homogeneous goods, the knowledge content of goods was low and the most important phase of the production process was manufacturing, since firms relied on economies of scale for market performance. Hence, tangible factors of production were held to be the most important, and economic productivity was held to be determined by a direct, causal relationship with the amount of physical

capital and labor employed. Today, the knowledge content of goods is of an order higher, and the pre-manufacturing phase is the key phase for value-creation [2]. An ever growing part of products of modern enterprises depends directly or indirectly on knowledge. Already today the part of the production factor knowledge is estimated to account on average 60% of the total value creation of the enterprises with increasing tendency [3].

According to Andriessen [1] there are seven characteristics of the intangible economy:

1. Knowledge replace labor and capital as a fundamental resource in production
2. The knowledge content of products and services is growing rapidly
3. The intangible economy is an economy in which services are as important as products
4. It is an economy in which the economic laws are different
5. In the intangible economy the concept of ownership of the resources has changed
6. The intangible economy is an economy in which the characteristics of labor have changed
7. As a result, organizations have changed

1.2 The value of Intangibles

The evaluation of knowledge plays in this aspect an important role. Nowadays if one talks about Intellectual Capital he refers to the knowledge of Enterprises. Strongly simplified as well as isolated from evaluation problems and from market psychology Intellectual Capital corresponds to the market-to-book value of an enterprise [4].

While trying to define closer the Intellectual Capital it can be concluded, that many various terms are used. Some of them include *intangible assets*, *intangible goods*, *intellectual property*, *intangible assets*, *intangibles* [5]. Especially Alznauer/Kiefel/Wille [6] indicate that using a

term of Intellectual Capital is frequently not valid, instead intellectual property term should be used, because it is about assets [7].

The number of methods for the determination of the Intellectual Capital has grown strongly in recent years. Sveiby [8] has listed chronologically 28 methods. It can be concluded, that *the model* for the Intellectual Capital Statement does not exist yet, and that each one exhibits both strengths and weaknesses [9,10]. While measuring the Intellectual Capital two approaches can be mentioned.

The deductive approach comes from the assessment market-to-book value of an enterprise. In this process information from balance sheets and quotations are used (...). The inductive approach is based on the description influencing factors of every single knowledge component of an enterprise in order to provide starting points to his development [11].

In the framework of this work, the *Intellectual Capital Statement – Made in Germany* [12] will be taken as a basis for further considerations.

2. MASS CUSTOMIZATION – TANGIBLES AND INTANGIBLES

2.1 The four levels of Mass Customization

Stan Davis, who coined the phrase in 1987, refers to Mass Customization when the same large number of customers can be reached as in mass markets of the industrial economy, and simultaneously they can be treated individually as in the customized markets of pre-industrial economies [13]. In order to address the implementation issues of Mass Customization, Tseng and Jiao [14] provide a working definition of Mass Customization that is very useful. The objective of Mass Customization is to deliver goods and services that meet individual customers’ needs with near mass production efficiency [15].

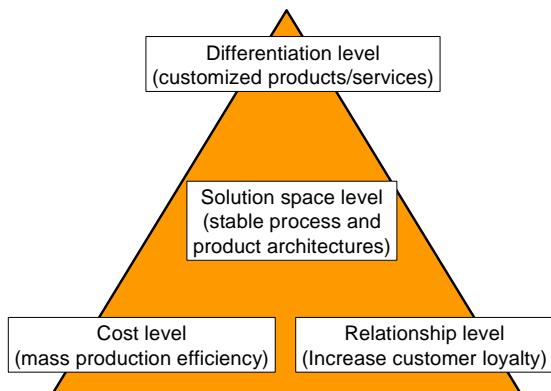


Figure 2: The four levels of mass customization [16]

The four levels of Mass Customization (Figure 2): While the differentiation level of Mass Customization is based on the additional utility (value) customers gain from a product or service that corresponds better to their needs, the cost level demands that this can be done at total costs that will not lead to such a price increase that the customization process implies a switch of market segments. The information collected in the course of individualization serves to build up a lasting individual relationship with each customer and, thus, to increase customer loyalty (relationship level). While the first three levels have a customer centric perspective, a fourth level takes an internal view and relates to the fulfillment

system of a mass customizing firm: Mass Customization operations are performed in a fixed solution space that represents [15] the pre-existing capability and degrees of freedom built into a given manufacturer’s production system [17].

2.2 Tangible Economy: Economies of Mass Customization

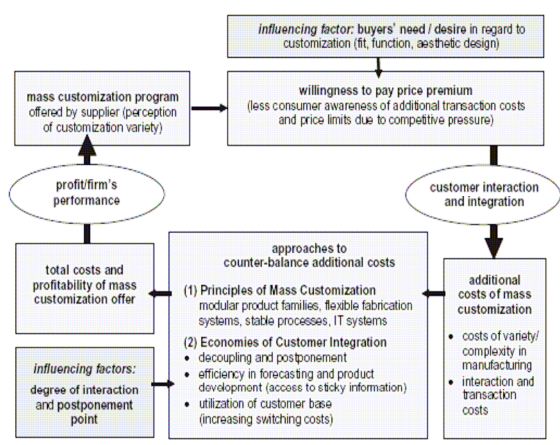


Figure 3: A model of value creation in Mass Customization Systems [18]

There are various papers on the economy of Mass Customization [18, 19, 20, 21]. It is often argued that on the one hand Mass Customization leads to a higher cost level and on the other hand it may lead to the reduction of costs (Figure 3). According to Piller/Stotko [16] the Mass Customization Strategy is sustainable, when the increase in costs can be balanced by the higher price and the potential for the new cost reductions. Altogether a conclusion may be drawn, that the total cost function is positive for Mass Customization Strategy, therefore the additional value for an enterprise is created. The coherence is as follows [16]:

- Increasing potential of profit: Acquisition, new business segments, image effects, increased willingness to pay.
- Costs with respect to the increasing potential of profit: Costs with respect to the customer integration, set up of variants, risk set up from the customer point of view and investment in the customer credibility.
- Cost reduction potential: Economies of Modularity, Economies of Decoupling, Economies of Integration, Economies of Relationship.
- Costs with respect to the potential of costs reduction: Investment in the flexible performance systems, measures in the reduction of complexity, information and communication effort in production.

According to Freund [22] the pure consideration of costs is not sufficient.

2.3 Intangible Economy: Economies of Mass Customization

In the Intangible Economy the question is: What is the contribution of Mass Customization to this important part of an enterprises’ value? A good start to answer this question is to look at the important role of information in Mass Customization Strategy [23]. The focus was shifted

from the information loop [19] to the knowledge loop (Figure 4).

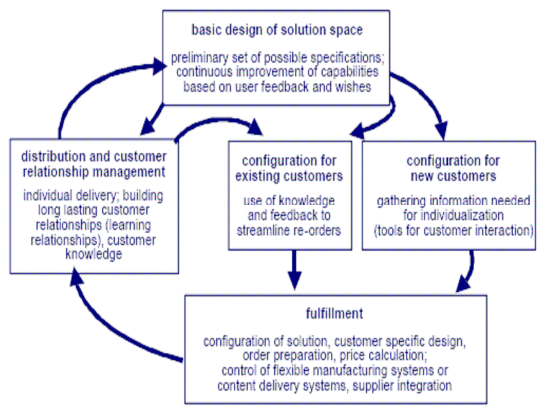


Figure 4: The knowledge loop of Mass Customization [24] adapted from [25]

The link between information and knowledge in Mass Customization Strategy is as follows [24]: (...) companies pursuing Mass customization successfully build an integrated information flow that not only covers one transaction but improves the knowledge base of the whole company by information gathered during the fulfillment of a customer-specific order. Companies successfully pursuing Mass Customization build an integrated knowledge flow – that not only covers one transaction but uses information gathered during the fulfillment of a customer specific order to improve the knowledge base of the whole company (...). The representation of these processes in a knowledge loop.

Knowledge is an abstract concept; it has no referent in the real world (...).The richness of the knowledge as a resource and knowledge as capital metaphors allow for a new and multidisciplinary view on organizations [26]. Knowledge management is not an easy fix to an organization's problems. It should be considered carefully and in a spirit of collaboration and communication with all those affected. Implemented well it can increase productivity, improve worker collaboration and shorten product development times. Implemented badly it may incur significant costs without delivering these benefits [27]. Knowledge management in Mass Customization System is of great significance, the more as the measurement of knowledge can contribute to the total value of an enterprise.

Value can be added in five dimensions [28]:

- Financial: The knowledge effort results in direct cost savings or an increase in revenues
- Innovation: By effectively developing, sharing and applying knowledge, organizations are better able to quickly develop and introduce new products and services
- Processes: Knowledge is or should be embedded in most processes. Examples include, but are not limited to: product development, marketing and sales, customer service and procurement. Knowledge management can help to make such processes more efficient and effective.
- Clients: Knowledge can help to create customer capital (...). Better understanding of customers and their needs will help to optimize product and service offerings. Furthermore, sharing knowledge with clients helps to build customer intimacy.
- Human (employees): Many employees can be considered as knowledge workers. Effective KM

means for them creating an organization in which they can develop and use their talents. It provides an environment in which it is fun to work and where they can learn and share with their colleagues, partners and clients. It means that the Human Capital of the organization can effectively be developed.

A goal of knowledge management is clearly to create Intellectual Capital, knowing that it can result in improved future financial performance! So, we can see that effective knowledge management will usually contribute to the development of Intellectual Capital. Measuring the added value of knowledge management therefore means measuring the contribution to the development of Intellectual Capital [28].

The basic driver behind knowledge management is the premise that, just as an organization producing capital goods would not allow its tangible assets to be under-utilized or unmanaged, an organization producing information and knowledge should not let its intellectual assets be under-utilized or unmanaged (Sullivan 2000:19). The next question is: What is the contribution of knowledge management in Mass Customization System to the Intellectual Capital of an enterprise. Based on the *Intellectual Capital Statement – Made in Germany* this should be analyzed.

3. INTELLECTUAL CAPITAL STATEMENT – MADE IN GERMANY

3.1 Introduction

The *Intellectual Capital Statement – Made in Germany* is an instrument to assess and to develop the Intellectual Capital of an organization. It shows how organizational and business goals are linked to the internal processes and the Intellectual Capital of the organization using indicators to visualize these element [30].

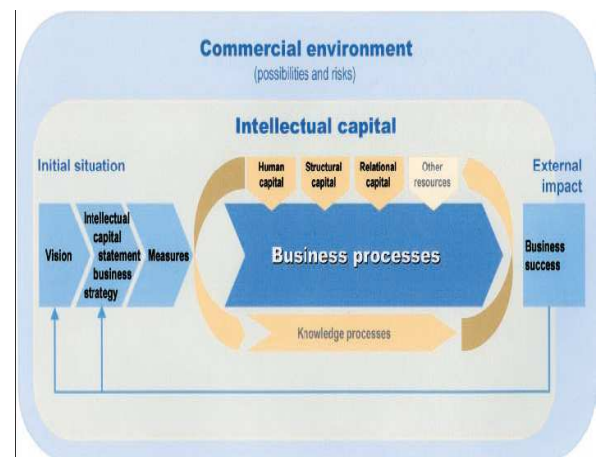


Figure 5: The Intellectual Capital Statement model developed by the Intellectual Capital Statement Project Group [30]

If one considers current international practice followed in preparing Intellectual Capital Statements and evaluates the common factors, it can be established that Intellectual Capital Statements (Figure 5) show an organization's Intangible assets. These are mostly taken as resources, and in line with the structure of Intellectual Capital, are distinguished as follows into human capital (employee skills, employee conduct, etc.), structural capital (IT, intellectual property, organizational culture, process organization, etc.) and relational capital

(customer relations, relations with suppliers, relations with the public, etc.) [30].

The complete Intellectual Capital Statement is drafted in six steps [30]:

1. What for? Initial Situation.
2. What? Intellectual Capital.
3. How good? Evaluation.
4. How much? Indicators.
5. Who? Communications.
6. How? Monitoring.

3.2 Intellectual Capital and Influencing Factors

Definitions according to the *Intellectual Capital Statement – Made in Germany* [30]:

Influencing Factor: In the event of changes, influencing factors affect business success and the organization's achievement of its goals. They can also relate to tangible (such as plant and machinery), financial (for instance loan and equity capital flows) and intangible assets (such as employee skills and organizational culture).

Human capital covers amongst other things the skills, abilities and motivation of employees. Human capital is owned by employees who can take their knowledge home with them or on to their next employer. Human capital cannot be completely controlled by the organization. Examples of typical influencing factors:

- HC1: Basic and further training of employees,
- HC2: Building staff experience,
- HC3: Building social skills,
- HC4: Motivating staff, and
- HC5: Building management competence.

Structural capital covers all those structures and processes which the employees need in order to be productive and innovative overall. It consists of all those intelligent structures which remain when the employees leave the organization after work. Examples of typical influencing factors:

- SC1: Developing product innovations (research & development),
- SC2: Developing process and procedural innovations,
- SC3: Organizing management processes,
- SC4: Developing a corporate culture,
- SC5: Cooperating and communicating internally,
- SC6: Providing information technology and explicit knowledge, and
- SC7: Transferring and ensuring knowledge.

Relational capital describes an organization's relations with customers and suppliers, as well as with other partners and the public. Examples of typical influencing factors:

- RC1: Caring for customer relationships,
- RC2: Caring for supplier relationships,
- RC3: Pursuing social commitment, work with
- RC4: Associations and public relations,
- RC5: Caring for relationships with investors and owners,
- RC6: Integrating external knowledge.

4. MASS CUSTOMIZATION AND IT'S CONTRIBUTION TO INTELLECTUAL CAPITAL STATEMENT – MADE IN GERMANY

4.1 Vision and Business Strategy

The increasing dynamic of economical activities initiates an innovation competition, that makes a continuous adjustment of performance programs necessary and a long term planning in many cases impossible. The increasing pressure on international competition leads today to the fact that in many branches a position advantage is not sufficient, but above all a top position should be achieved on all relevant action fields. In addition to the cost relevant structure there is also the demand for higher quality and technological leadership, but also for agility and higher supply service [16].

Mass Customization offers here a relatively good alternative to the generic concepts of Porter [19], however still misses the knowledge perspective and the corresponding knowledge system strategy with its strategic and operative knowledge targets in the knowledge evaluation.

4.2 Business Processes - Performance Processes

Organizations are as a rule constructed on a division-of-labor basis. All measures and steps aim to provide a product or service that is useful to the customer. It is also possible to describe this as the performance process, which usually commences with an order and leads via purchasing necessary components and preliminary services, as well as processing them (production or service) through to the actual product of the organization. The sales department ensures that the products are sold to current or potential customers. Consequently, the performance processes are the central, most important processes of an organization around which all other processes gather. It is therefore important to be clear about these processes in order to be able to better evaluate the impact of changes [30].

Basic pattern of the potential formation of Mass Customization is the modularization of the enterprise as well as of the product and the process level (...). In the way of the modularization of the enterprise (process level) traditional hierarchic structures will be replaced by integrated customer oriented processes, which will be set up by relatively small and clear units (process modules), that will be tuned via a central non hierarchical coordination forms [16].

If Mass Customization should make an important contribution in the context of the *Intellectual Capital Statement - Made in Germany*, then next to the Mass Customization processes also the corresponding knowledge processes should be considered.

4.3 Intellectual Capital and Mass Customization

Mass Customization	Intellectual Capital																	
	Human Capital (HC)					Structural Capital (SC)							Relational Capital (RC)					
	1	2	3	4	5	1	2	3	4	5	6	7	1	2	3	4	5	6
Differentiation Level		+																
Cost Level																		
Relationship Level		+																
Solutionspace Level	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Figure 6: Contribution of the four levels of Mass Customization to the Intellectual Capital.

Figure 6 presents the four levels of Mass Customization in relation to the influencing factors for human capital, structural capital and relational capital.

The first more qualitative analysis indicates that the levels of Mass Customization can considerably influence Intellectual Capital. The cost level is more focused on the traditional accounting system (tangible economy).

The *Intellectual Capital Statement – Made in Germany* goes by the consideration of the influencing factors that far, that at the end of the process interdependencies in the Intellectual Capital field can be shown (systemic consideration of the enterprise). If an interdependency circle is closed, a so-called *generator* is found. A generator describes a closed loop in the interdependency network and can help to control the Mass Customization System.

The process of the *Intellectual Capital Statement – Made in Germany* is an effort for self evaluation, so each enterprise determines in this way also the business specific interdependency to Mass Customization Strategy.

The value of (Mass Customization) knowledge implemented towards action in one context (or having the potential to be), may be absolutely worthless in another (Ariely 2003:3-4).

5. CONCLUSION

The shift in a direction to Intangible Economy indicates that enterprises should not only manage traditional resources (tangibles) but should also consider intangible property (intangibles), which also constitutes the enterprises' value. The first more qualitative results show that Mass Customization

- positively influences the vision/strategy of a company, but the knowledge perspective of the strategy should be added.
- Positively influences business processes, but knowledge processes should be added.
- Positively influences Intellectual Capital (Human Capital, Structural Capital and Relational Capital)

In order to prove and substantiate the first outcomes, the influence of Mass Customization on Intellectual Capital should be quantitatively described.

The researches must comply with the fact, that Mass Customization can influence the development of the *Intellectual Capital Statement – Made in Germany*. The current discussions must consider the economy of Mass Customization in broader perspective, with Intellectual Capital included.

6. REFERENCES

- [1] Andriessen, D. (2004): Making Sense of Intellectual Capital. Designing a Method for the Valuation of Intangibles.
- [2] Eustache, C. (2003): The Prism Report. URL: http://www.euintangibles.net/research_results/Final_Report.pdf
- [3] Wuppertaler Kreis e.V. (Ed.) (2000): Wissensmanagement in mittelständischen Unternehmen, Köln.
- [4] Picot, A.; Scheuble, S. (2000): Die Rolle des Wissensmanagements in erfolgreichen Unternehmen. In: Mand/Reinmann-Rothmeier (Ed.) (2000): Wissensmanagement, pp. 19-37
- [5] Schäfer, H.; Lindenmayer, P. (2004): Externe Rechnungslegung und Bewertung von Humankapital. URL: http://www.bwi.uni-stuttgart.de/fileadmin/abt3/Publikationen/mbf_schaefer_humankapital_09_2004.pdf
- [6] Alznauer, T.; Kiefel, J.; Wille, K. (2004): Erste Schritte auf dem Weg zur ökonomischen Bewertung und Bilanzierung von Wissensprodukten. In: Hasebrook, J.; Zawacki-Richter, O.; Erpenbeck, J. (2004): Kompetenzbilanz, pp. 121-136, Frankfurt/Main.
- [7] Andriessen, D. (2005): On the metaphorical nature of intellectual capital: A textual analysis. The 4th International Critical Management Studies Conference Judge Institute of Management, University of Cambridge July 4-6, 2005.
- [8] Sveiby, K.-E. (2004): Methods for Measuring Intangible Assets. URL: <http://www.sveiby.com/articles/IntangibleMethods.htm>
- [9] Schäfer, A. (2001): Bewertung Intellektuellen Kapitals, Osnabrück.
- [10] Grübler, D.; North, K.; Szogs, G. (2004): Intellectual Capital Reporting – ein Vergleich von vier Ansätzen. In: zfo 1/2004, pp. 19-27.
- [11] Bartel, E.; Gieri, R.; Kühn, I.-W. (2004): Humankapital in Unternehmen – Ansätze zur Bewertung. In: Hasebrook, J.; Zawacki-Richter, O.; Erpenbeck, J. (Ed.) (2004): Kompetenzbilanz, pp. 17-50, Frankfurt/Main.
- [12] Federal Ministry of Economics and Labour (Ed.) (2004): Intellectual Capital Statement – Made in Germany, Berlin, Germany. URL: <http://www.bmwa.bund.de/Redaktion/Inhalte/Pdf/br-wissensbilanz-englische-fassung.property=pdf.pdf>
- [13] Davis, S. M. (1987): Future perfect, MA, Addison-Wesley publishing company, INC
- [14] Tseng, M.M. , Jiao, J. (2001): Mass Customization, in G. Salvendy (Ed.) Handbook of Industrial Engineering, 3rd edition, New York: Wiley, 2001, pp. 684-709.
- [15] Piller, F. (2003): Mass Customization News. Newsletter Vol. 6 No. 1. URL: http://www.mass-customization.de/news/news03_01.htm

- [16] Piller, F. ; Stotko, C. (2003): Mass Customization und Kundenintegration, Düsseldorf
- [17] Von Hippel, E. (2001): Perspective: User Toolkits for Innovation, The Journal of Product Innovation Management, 18 , pp. 247-257.
- [18] Piller, F.; Moeslein, K.; Stotko, C. (2004): Does Mass Customization pay? An economic approach to evaluate customer integration. In: Production Planning & Control, Vol. 15, No. 4, June 2004, pp. 435–444 URL: <http://www.mass-customization.de/download/ppc04.pdf>
- [19] Piller, F. (1998): Kundenindividuelle Massenproduktion, München.
- [20] Piller, F. (2000): Mass Customization, Wiesbaden.
- [21] Grasmugg, S.; Schoder, D. (2002): Mass Customization im Kontext des Electronic Business: Empirische Untersuchung der Erfolgswirksamkeit, Proceedings of Multi-Konferenz Wirtschaftsinformatik 2002, in: Weinhardt, C./Holtmann, C. (Hrsg.): E-Commerce, Netze, Märkte, Technologien, Physica Verlag, Heidelberg, pp. 129-142.
- [22] Freund, R. (2004): Mass Customization and Multiple Intelligences. 1st MCP-Conference in Central Europe, Rzeszow, Poland. URL: <http://www.robertfreund.de/download/Robert%20Freund%20Keynote%20MCPC2004%20Rzeszow.pdf>
- [23] Riihimaa, J.; Ruohonen, M.; Mäkipää, M. (2004): Transitions in Mass Customization Strategies – Requirements for Information Systems. URL: http://www.cs.uta.fi/is/julkaisut/2004/2004_Riihimaa_Ruohonen_Makipaa.pdf
- [24] Piller, F.; Stotko, C. (2002): Four approaches to deliver customized products and services with mass production efficiency. In: Durrani, T. S. (Ed.): Proceedings of the IEEE International Engineering Management Conference. Managing Technology for the New Economy, Cambridge University, UK, 18-20 August 2002, Bd. II, pp. 773-778
- [25] Reichwald, R.; Piller, F.; Möselein, K. (2000): Information as a Critical Success Factor for Mass Customization, Proceedings of the ASAC-IFSAM Conference, Montreal.
- [26] Andriessen, D. (2005): On the metaphorical nature of intellectual capital: A textual analysis. URL: <http://www.mngt.waikato.ac.nz/research/ejrot/cmsconference/2005/proceedings/intellectualcapital/Andriessen.pdf>
- [27] Coakes, E. (2004): KNOWLEDGE MANAGEMENT – A PRIMER. In: Communications of the Association for Information Systems, Volume 14, 2004, pp. 406-489. URL: <http://web.njit.edu/~bieber/CIS677F04/coakes-cais2004.pdf>
- [28] CEN (2004): European Guide to good Practice in Knowledge Management - Part 4: Guidelines for Measuring Knowledge Management URL: <ftp://cenftp1.cenorm.be/PUBLIC/CWAs/e-Europe/KM/CWA14924-04-2004-Mar.pdf>
- [29] Sullivan, P.H. (2000): Value-driven intellectual capital, New York.
- [30] Federal Ministry of Economics and Labor (2004): Intellectual Capital Statement – Made in Germany. URL: <http://www.bmwa.bund.de/Redaktion/Inhalte/Pdf/W/wissensbilanz-englische-fassung-lowres.property=pdf.bereich=rwb=true.pdf>
- [31] Ariely, G. (2003): Knowledge Management as a Methodology towards Intellectual Capital. 3rd European Knowledge Management Summer School 7-12 Sept, 2003 San Sebastian, Spain. URL: http://www.providersedge.com/docs/km_articles/KM_as_a_Methodology_Towards_Intellectual_Capital.pdf