

PECULIARITIES OF THE BUSINESS INFORMATION QUALITY ASSESSMENT

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This paper analyses peculiarities of the business information quality assessment. It reveals the importance of information quality in a daily business world. Also it defines leading information quality dimensions that are the basis for information quality assessment. The paper reveals the results of accomplished research that captures dimensions of information quality that are most important to Lithuanian organizations' business information consumers. Finally, information quality management model is presented.

The first chapter of this paper presents the information quality dimensions proposed by successful and leading information practitioners and researchers Wang and Strong. These proposed dimensions are the result of their empirical research made in 1996 that captures the aspects of information quality that are important to information consumers. These information quality dimensions are the background of information quality assessment that made the high influence to the further information quality development.

Authors of this paper also wanted to know, what information quality dimensions are important to Lithuanian information consumers. So the survey that aim was to find out the most important dimensions to Lithuanian information consumers was taken in the spring of 2006. The results of this survey showed that dimensions, which are important to Lithuanian information consumers, are not exactly the same as the dimensions proposed by Wang and Strong in 1996. Information dimensions such as accuracy, objectivity, believability, access, relevancy, value-added, timeliness, completeness and ease of understanding are very important to Lithuanian information consumers and Wang and Strong identified these dimensions. Dimensions like: reputation, security, amount of data, interpretability and concise (consistent) representation presented by Wang and Strong, are not so important to Lithuanian information consumers. For Lithuanian respondents more important dimensions are adaptability for professional needs, up-to-date, secrecy, manageability and price (cost).

In the second chapter of this paper authors present the model of information quality management. The aim of this model is to reach high-quality information product (IP) that matches the end-user expectations. This model shows the resources that create and influence the information. Without these resources information management process would be impossible. These resources are: employee's knowledge and experience, technologies, IT, data, rules and time. Information quality management model, suggested by the authors of this paper, draws guidelines and with continuously improvement it can service like pattern for information quality assessment.

Key words: *information quality, quality assessment, quality assessment mode.*

Introduction

We cannot imagine modern society without information. Information became and still is the leading and inherent component of every our activity. Day after day, we hear words like “information”, “information society”, “knowledge management”, “knowledge economics”, etc. These concepts are used so often that it seems if the information becomes an object of cult.

Really, in modern business information it is a matter of primary interest. Business processes like planning, product development and production; purchasing, market, production sales and distribution not only drive all business, but also generate precious information. Methods and principles of quality management that were designed to improve the quality of mentioned processes for a long time were not adjusted to information. However, the efficiency of the above-mentioned business processes relies on the information quality, because quality information that we use in due business time and position scores a great business success. So organizations that want to gain competitive advantage should treat information not only as subsidiary business element, but also as a product that quality may differ and that should be managed efficiently using appropriate methods, principles and means of quality management.

Information quality –is the sum of information quality characteristics that satisfy or even exceed information consumers' (knowledge workers') expectations and needs [4; 7]. Only high quality information enables to make reasonable business decisions. Consequently, this is information that is delivered to the right person at the right time and place. Topical modern business problems are as follows: how to pick right information from its abundance, how to decide which information is correct, and which one is useless, finally, how to assess the quality of information. The last-mentioned problems are topical and important to international and Lithuanian business. The purpose of this work is to reveal the peculiarities of the business information quality assessment and, according to analysis of scientific literature and also the results of the survey of our country's business information consumers, to prepare information quality management model.

1. Information quality (IQ) dimensions

Latterly, information and various information sources are booming, information consumers' and managers' understanding about information also grows. On the other hand, information is important to business, not only because quality information enables organizations to vouchsafe competitive business development, but

also it helps to improve internal business processes. Consequently, there is an increased demand on high quality information, and information becomes a guarantee of success [10]. Organizations should understand how to evaluate information and separate the quality information from the useless one, and so information quality assessment models can help to manage these problems. Information quality measurement and assessment is based on the assumption that if a material product has quality characteristics and dimensions so and information has particular quality dimensions, which we can distinguish and, finally, evaluate. Wang and Strong works have the biggest international recognition in the field of information quality research [26]. One of the results of their scientific and research works was the identification of key information quality dimensions. These dimensions are recognized and have a big value to various range information consumers, and also these IQ dimensions are the methodological basics for IQ assessment and measurement. This laid the foundations for information quality science and its development [1-25]. Wang and Strong not even identified the essential information dimensions, but also proposed to group them into four IQ categories (Table 1.) [26]:

- *Intrinsic Information Quality (IQ)* denotes that information have quality in their own right, so the underlying dimensions of this category capture the intrinsic aspect of information quality. This category includes not only accuracy and objectivity, but also believability and reputation. This suggests that, contrary to the traditional view, information consumers also view the importance of knowing where the information comes from. So believability and reputation should also be treated as the integral part of intrinsic IQ. Because, accuracy and objectivity alone are not sufficient for information to be considered of high quality.
- *Accessibility Information Quality (IQ)* emphasizes the importance of the systems. The systems and information databases must be accessible but also secure. The authors of this paper revise the definition of accessibility and emphasize that this dimension should be treated as the ability to access concrete information, also absence of accessibility barriers for concrete information consumers.
- *Contextual Information Quality (IQ)* – the requirement that information quality must be considered within the context of the task at hand. The underlying dimensions are completeness and timeliness.
- *Representational Information Quality (IQ)* - it points up the importance of the systems. This category includes aspects related to the format of the information and meaning of information.

Table 1. **The dimensions and categories of information quality (IQ)**

<i>IQ category</i>	<i>IQ dimension</i>
Intrinsic IQ	Accuracy, believability, reputation, objectivity
Access IQ	Access, security
Contextual IQ	Relevancy, value-added, timeliness, completeness, amount of data
Representational IQ	Interpretability, ease of understanding, concise and consistent representation

Authors of this paper sought to identify what IQ dimensions are the most important for Lithuanian information consumers. There are about 200 various dimensions and factors that determine information quality in information literature [1-26]. Majority of the mentioned dimensions are introduced in an interactive Internet page [15]. An in-depth essence and content analysis of quality dimensions defined by various authors was done, and as a result, authors of this paper selected 31 basically different IQ dimensions. The list of selected 31 IQ dimensions was included into the survey questionnaire that was addressed to Lithuanian business organizations. The sample size of the research consisted of 65 organizations that enabled to have the results with reliability of ninety percent (90%). The questionnaire asked the respondents to select up to 10 most important information quality dimensions from the list of 31 dimensions. The results of the research are summarized in Fig.1.

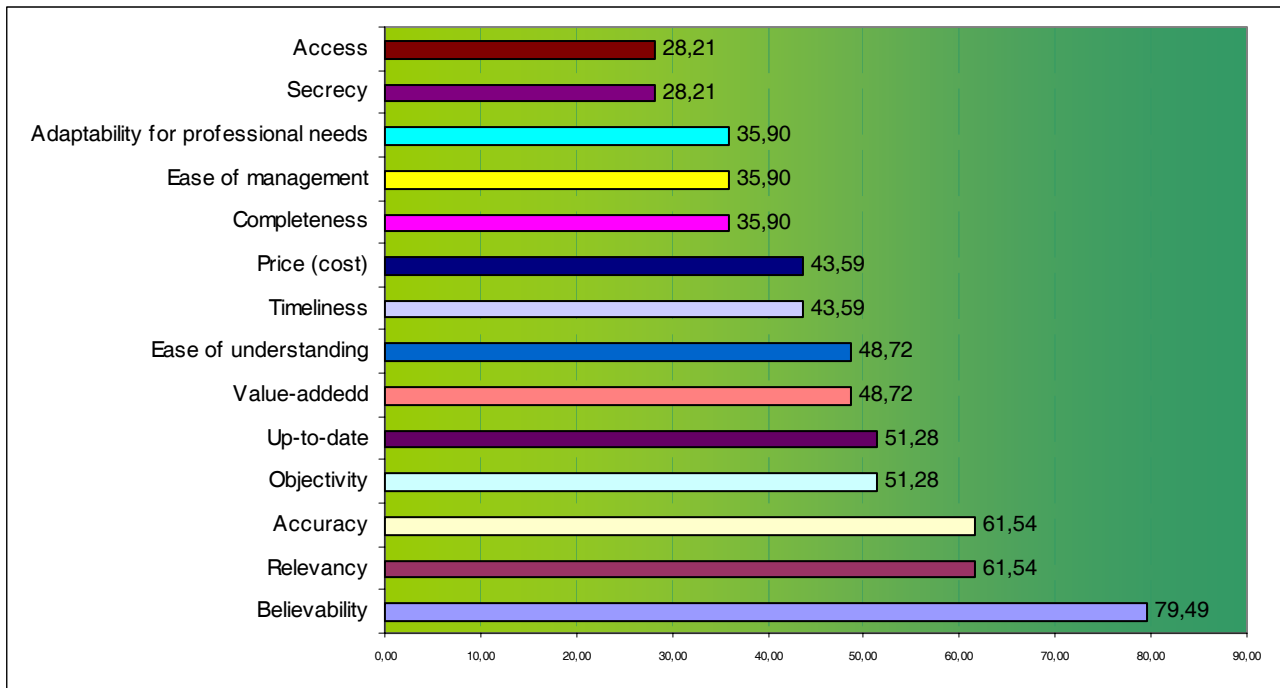


Fig. 1. Most important information quality dimensions (answers in %)

The research findings show that the most important information quality dimension for Lithuanian business organizations is information *believability*. Even 79.49% of the respondents indicate that believability is essential dimension. Such information dimensions like *relevancy* and *accuracy* are equally important for information consumers, because 61.54% of the respondents pointed them as important. Surprisingly, but from the list with 31 dimensions no one picked the *ease of information maintenance*.

Information quality dimensions obtained from our exploratory research were compared with dimensions that are the result of Wang and Strong empirical research made in 1996 [26] (see Table 2).

Table 2. Comparison of the information quality dimensions

The result of the empirical research made by Wang and Strong in 1996		The results of the research accomplished by the authors of this paper in 2006.
Accuracy	↔	Accuracy
Objectivity	↔	Objectivity
Believability	↔	Believability
Reputation		<i>Adaptability for professional needs</i>
Access	↔	Access
Security		<i>Up-to-date</i>
Relevancy	↔	Relevancy
Value-added	↔	Value-added
Timeliness	↔	Timeliness
Completeness	↔	Completeness
Amount of data		<i>Secrecy</i>
Interpretability		<i>Ease of management</i>
Ease of understanding	↔	Ease of understanding
Concise and consistent representation		<i>Price (costs)</i>

Authors of this paper strove to compare the findings of exploratory research with the findings of the research made 10 years ago. In the light of these facts, authors of this paper also listed 14 information quality dimensions obtained from the findings of the exploratory research.

The arrows in Table 2. show IQ dimensions that matched. The dimensions written in “*italic*” are identified with exploratory research made by the authors of this paper and these IQ dimensions have no correspondence between the results of last-mentioned research and the results of Wang, Strong research made

in 1996 [26]. The dimensions written in “bold” were identified with the research made by Wang and Strong in 1996 [26], and those dimensions do not correspond with the dimensions identified by the authors of this paper.

Information quality dimensions such as accuracy, objectivity, believability, access, relevancy, value-added, timeliness, completeness and ease of understanding are very important for Lithuanian information consumers and these nine dimensions [26] were identified by Wang and Strong. Unfortunately, five IQ dimensions like reputation, security, amount of data, interpretability and concise/consistent representation, presented by Wang and Strong [26], are not so important for Lithuanian information consumers. For Lithuanian respondents more important dimensions, instead of these five, are: adaptability for professional needs, up-to-date, secrecy, manageability and price (cost). So, the results of this survey showed that dimensions, which are important to Lithuanian information consumers, are not exactly the same as the dimensions proposed by Wang and Strong [26] in 1996. Only nine IQ dimensions matched, and other five from the list with 14 IQ dimensions did not correspond.

To bring a conclusion, to ensure IQ information must be produced in accordance with clearly defined information quality dimensions just like other products (services and goods) are supplied and evaluated according to specific quality characteristics. Consequently, information quality dimensions are the basis of information quality assessment.

2. Information quality (IQ) management model

For the meantime, there is no single method for information quality assessment and hardly will it be created, because in different circumstances and for the different information consumers the importance of information quality dimensions will be different too. Some authors like Wang, Lee, Pipino, Strong [2; 19; 20; 24; 25; 26] analyse what quality information should be – its characteristics, features, assessment, but just few authors reveal the factors that create, influence and determine information quality and its characteristics, which assessment methodology is so important to create. Consequently, the authors of this paper present the model wherein information quality management is shown as a system which functions in a special environment. The purpose of this model is to show the structure of information resources, the place of information quality management system in the information manufacturing process, information assessment and processing to the final information product that satisfy or even exceed information consumer expectations and needs.

Quality of information and its dimensions are under the influence of those factors that create and determine the information (information product - IP).

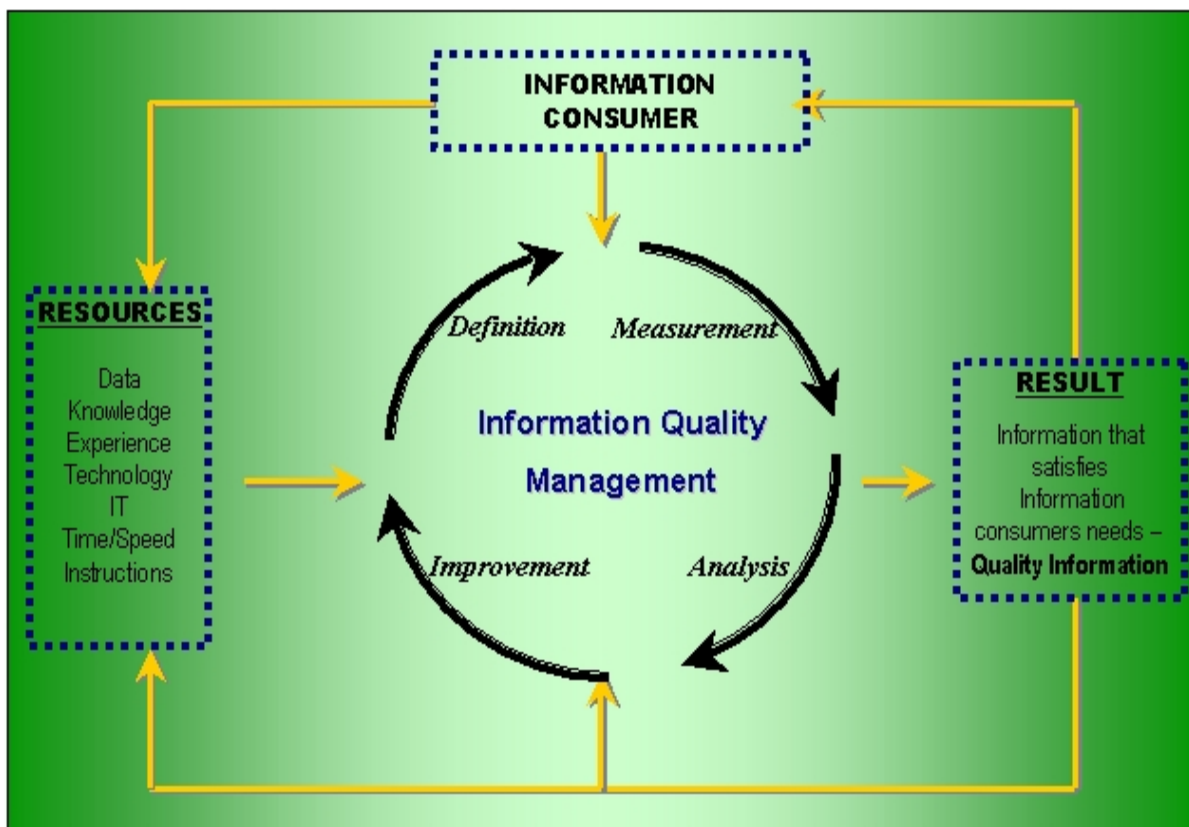
Lagefors, who also researches this field, marks specific resources that create information: people, their experience, technologies and time [1]. The process of information system created by Lagefors might be applied to the topic of information quality (IQ). Lagefors formulates the process of obtaining information to be $I = i(D, S, t)$, where I - information; i - information manufacturing system, which result is information product; D - data; S - user's experience or knowledge; t - certain time, to manage the task [20].

According to Lagefors, people with different experience or at different times might interpret particular information different [1]. Technology, which is used by the organization, also plays the big role. So, data, personal experience, technology and time create necessary circumstances for information process. Consequently, these factors are the basics for information quality creation and determine final information manufacturing result. But authors of this paper penetrate some limitation - Lagefors identifies and/or treats experience and knowledge as alternative factors.

Marchand [21] also tried to answer the question which factors determine information processes and systems. He states that processes are not only under the influence of technologies, but they also depend on the information technologies (IT). Also, Marchand proposes one more factor that was not marked by Lagefors that is employee knowledge. This factor is very important and it must be included. The difference between experience and knowledge might be presented with the statement that employees might have knowledge, but it does not mean that they know how to use it in practice. Consequently, terms like experience and knowledge, at least in this context, should be separated and not treated as identical terms.

Al-Hakim [1] summarizes Marchand's and Lagefor's ideas and presents the model of information quality system environment. This model figures information manufacturing resources, the result, mechanism and control. Authors of this paper generalized and merged Al-Hakim's model [1] with Wang's developed Total Data Quality Management (TDQM) system [25] and as a result introduce model of information quality management (see Figure 2). There are some substantial differences between Al-Hakim [1] model and model proposed by the authors of this paper. *First*, authors enter information technologies (IT), because technologies and IT have different meanings. *Second*, authors include other important factor that was marked by Marchand it

is employee knowledge. *Third* difference results from the second one. Authors of this paper emphasize that every information worker has different experience and knowledge. Experience and knowledge of two employees will never coincident – they will differ. Also, if information manager (worker) and information end-consumer have different knowledge and experience then it is very hard to ensure information quality. Information end-consumer might not know how to explain his requirements and expectations of final information product to information worker. In opposite situation, information worker's delivered information product might be too complicated to understand for information end-consumer. And if this variance emerges between information workers, for example information provider and information creator, then information quality will not be ensured. According to the authors of this paper, the gap might be liquidated by implementing particular instructions that should be introduced to every information worker and information end-consumer. Particular preconceived instructions draw the frame for final information product and prevent from different interpretation. So there should be one more factor – information department instructions. *Fourth*, information end-consumer is separated from the information manager (worker) that collect, process, creates information. This end-consumer is presented like external factor, but in many situations information worker and end-consumer is the same person. Information end-consumer is like information client that lists particular requirements for future information product. *Fifth*, authors of this paper give additional meaning for the conception “time” proposed by Langefors. Term “time” in Langefors theory means a certain time, to create (find, sort, assess and process data) quality information. Authors of this paper agree that this factor has direct influence on information quality, but also propose to complement the meaning of time with more accurate term “speed” which means the speed of information creation. The faster we need information product the bigger possibility to have inaccurate, unreliable, amiss information. If we have enough time, then we can check, assess information quality, but if we have little time its quality can suffer. So IQ characteristics, which were discussed by Wang and Strong [26], can disappear. If these IQ dimensions are eliminated just because of information processing speed, then the term “speed” should be included into the list of factors that determine information quality.



Source: Own elaboration on the basis of on [1; 23; 25])

Fig. 2. Information quality management model

This information quality management model is based on the principle of E. Deming cycle “plan, do, check, act”. In this model function information quality definition, measurement, analysis and improvement

procedures and it reflects resources and factors that are essential to create information quality. The result of this model is information (quality information or information product) that satisfies end-consumer needs.

Consequently, to possess quality information, an organization must clearly define its resources that create information and implement business information quality management system.

Conclusions

Only high quality information enables to make reasonable business decisions. Consequently, this is information that is delivered to the right person at the right time and place. Topical modern business problems are: how to pick right information from its abundance, how to decide which information is correct, and which one is useless, finally, how to assess the quality of information. The last-mentioned problems are topical and important to international and Lithuanian business.

The research findings show that the most important information quality dimension for Lithuanian business organizations is information *believability*. Even seventy-nine point forty-nine percent (79.49%) of respondents indicated that believability is essential dimension. Such information dimensions like *relevancy* and *accuracy* are evenly important to information consumers, because sixty-one point fifty-four percent (61.54%) of respondents pointed them as important. Surprisingly, but from the list with 31 dimensions no one picked the *ease of information maintenance*.

To ensure information quality, information must be produced in accordance with clearly defined information quality dimensions, just like other products (services and goods) are supplied and evaluated according to specific quality characteristics. Consequently, information quality dimensions are the basis of information quality assessment.

Proposed model aims to show information quality management as a system, which functions in the special environment. The purpose of this model is to show the structure of information resources, the place of information quality management system in the information manufacturing process, information assessment and processing to the final information product that satisfy or even exceed information consumer expectations and needs. This model might service like one of the tools for information quality assessment in the organizations.

REFERENCES

1. AL-Hakim L. (2004). Information Quality Deployment, *Proceeding of Ninth International Conference on Information Quality*, p.170-182. – Internet: <http://www.iqconference.org/Documents/IQ%20Conference%202004/Papers/IQFunctionDeployment.pdf> (Viewed in 2005.12.10)
2. Ballou D., Madnick S., Wang R. (2003). Assuring Information Quality, *Journal of Management Information Systems*, No.1,p. 9-11.
3. Caballero I., Gomez, O., Piattini M. (2004). *Proceedings of the Ninth International Conference on Information Quality (ICQ-04)*, p. 44-58. – Internet: <http://www.iqconference.org/Documents/IQ%20Conference%202004/Papers/GettingBetterIQ.pdf> (Viewed in 2005.12.10).
4. English L. (1996). Information Quality: Meeting Customer need, *Information Impact Newsletter*.
5. English L. (2000). Plain English on Data Quality: Information Quality Management: The Next Frontier, *DM Review Magazine*. – Internet: http://www.dmreview.com/article_sub.cfm?articleId=2073. (Viewed in 2005.12.10).
6. English L. (2003). Quality Conversation with Larry English, *Quality Digest*, p.67-68.
7. ENIAC. – Internet: <http://www.thocp.net/hardware/eniac.htm>. (Viewed in 2005.12.11)
8. Eppler M. J. (2000). Conceptualizing Information Quality: A Review of Information Quality Frameworks from the Last Ten Years, *Proceedings of the 2000 Conference on Information Quality*. – University of St. Gallen, p. 83-96.
9. Eppler M.J., Hyams M.R. (2004). Information Quality in Complex Sales, *Proceedings of ninth International Conference on Information Quality*, p. 389-401.
10. Evaluating Process Documentation — Part One: *Quality and Value*. 2006.04.04. Internet: http://www.informit.com/guides/content.asp?g=it_management&seqNum=121&rl=1 (Viewed in 2006.05.20).
11. Gackowski Z. J. (2004). Logical Interdependence of data/Information Quality Dimensions – A purpose-focused View on IQ, *Proceedings of ninth International Conference on Information Quality (ICIQ-04)*. – Internet: <http://www.iqconference.org/Documents/IQ%20Conference%202004/Papers/LogicalInterdependence.pdf> (Viewed in 2005.12.10).
12. Gelle, E., Karthu, K. (2003). Information quality for strategic technology planning, *Industrial Management & Data Systems*, Vol. 103/8, p.633-643.
13. Gerkes M. (1997). Information Quality Paradox of the Web. – Internet: <http://izumw.izum.si/~max/paper.htm>. (Viewed in 2005.12.01).
14. Infomanija mažina IQ greičiau nei marihuana. – Internet: http://ml.lms.lt/index.php?option=com_content&task=view&id=468 (Viewed in 2006.05.25).
15. Interactive Information Quality Tool.For the exploration of IQ concepts, dimensions and attributes. – Internet (interactive page): http://ghill.customer.netspace.net.au/iq_attr.html (Viewed in 2006.05.20).
16. Jarke M., Vassiliou Y. (1997). Fundations of Data Warehouse Quality, *Second Conference on Information Quality*. – Internet: http://www.cs.brown.edu/courses/cs227/Papers/Projects/iq97_dwq.pdf (Viewed in 2006.01.09).
17. Kahn B.K., Strong D.M., Wang R.Y. (2002). Information Quality Benchmarks: Product and Service Performance, *Communications of the ACM*, Vol.45, No.4, p.184-192.

18. Khalil O., Strong D. M., Kahn B. K., Pipino L. L. (1999). Teaching Information Quality in Information Systems Undergraduate Education, *Informing Science*, Vol. 2, No.3, p. 53-59.
19. Knight S., Burn J. (2005). Developing a Framework for Assessing Information Quality on the World Wide Web, *Informing Science Journal*, Vol. 8, p. 27-34.
20. Lillrank P. (2003). The quality of information, *International Journal of Quality & Reliability Management*, Vol.20, No.6, p. 691-703.
21. Marchand A. D. (2004). Reaping the business value of IT: Focus on Usage, not just deployment, to optimise payback. Internet: <http://www01.imd.ch/news/research/perspectives/index.cfm?art=2680> (Viewed in 2005.12.28).
22. Myers, R. (2006). IQ Matters: Boosting Information Quality. – Internet: <http://www.cfo.com/printable/article.cfm/5545859?=&options> (Viewed in 2006.06.07).
23. The Deming Cycle. – Internet: http://www.valuebasedmanagement.net/methods_demingcycle.html. (Viewed in 2005.12.13).
24. Wang, R. Y., Pipino, L.L., Lee, W.Y. (2002). Data quality assessment, *Communication of the ACM*, Vol.45, No.4, p. 211-218. – Internet: <http://mitiq.mit.edu/Documents/Publications/TDOMpub/2002/DQ%20Assessment.pdf> (Viewed in 2005.12.10).
25. Wang, R.Y. (1998). A product perspective on total data quality management, *Communications of the ACM*. – Internet: <http://mitiq.mit.edu/Publications.htm#1998> (Viewed in 2005.11.20).
26. Wang, R.Y., Strong, D.M. (1996). Beyond accuracy: What data means to data customers, *Journal of Management Information Systems*, Vol.2, p. 210-232.– Internet: http://web.edu/tdqm/www/tdqmpub/beyondaccuracy_files/beyondaccuracy.html (Viewed in 2005.12.20).