BUSINESS INTELLIGENCE SYSTEM SUCCESS ASSESSMENT USING DELONE & MCLEAN MODEL

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ABSTRACT:
Business Intelligence (BI) system is a crucial part of large and also medium company's information system. Its successful implementation mostly plays important role in achieving competitive advantage. This paper aims to present latest results of our ongoing research in the field of application of general DeLone & McLean information system success assessment model on BI system success assessment.

KEYWORDS:
Business Intelligence, success assessment, DeLone & McLean model, success factors

1. Introduction

Business Intelligence (BI) system plays important role in today medium and large enterprises decision making process. Relevance of analyses using BI tools depends highly on qualitative factors that typically characterize BI system usage from various points of view (user satisfaction, technical maturity, infrastructure flexibility, business process alignment etc.). Therefore a complex and well structured assessment of those factors could be desired, if an enterprise wishes to maintain high quality of its BI services and to ensure its success and usage continuity. There are theoretically many ways, how to perform an assessment of success of a computer system. One of these ways is the DeLone & McLean information system success model (D&M IS success model). This paper aims to present characteristics of the D&M IS success model and assess its ontological relevance to an assessment of the Business Intelligence system success, as latest results of our current research project on this case, on which currently participates a team of 3 academics and 4 students.

2. Literature review on Business Intelligence success factors and D&M IS success model topics

A literature review was conducted from January to February 2011 according to our projects schedule. We were searching for literature and journal articles – literature where business intelligence and factors of its success were discussed and journal articles, where the D&M IS success model or its application is discussed. The literature review was conducted using Google search engine, which is closely connected with Google's literature search engine – Google Books. For the search of journal articles entries we used mainly SpringerLink and Scopus search engines.
The review of journal article entries on the "D&M IS success model" topic discovered numerous journal articles that discuss either the D&M IS success model application under specific conditions, or theoretically cover the very nature and dimensional characteristics of D&M IS success model. Reviewed journal article entries showed also some partial applications of the D&M IS success model in data warehousing.

3. Theoretical foundations of the DeLone & McLean information system success model

According to Wu and Wang (2006) the D&M IS success model was first introduced in 1992 by DeLone and McLean, who made a thorough review of IS success literature and proposed a model that showed specific dimensions of information system success and their mutual relations. In 2003 DeLone and McLean made an update in their model, in light of numerous critics and discussions of their original model concept, and its application under specific conditions, in journal articles. Figure 1 shows the structure of D&M IS success model as introduced in 2003 by DeLone and McLean (2003) and relations between model dimensions. The latest version of the model (as of 2003) will be then used for argumentation in paragraph 4.
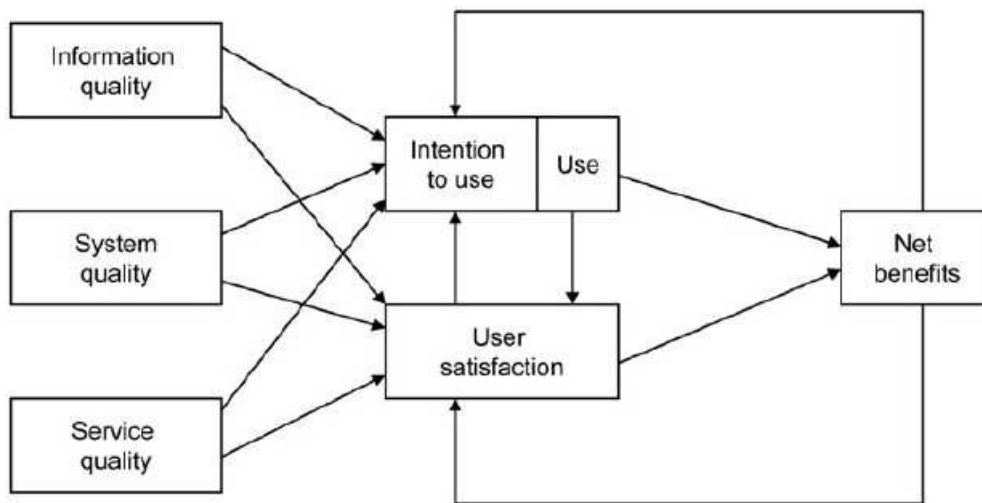

Figure 1. Updated DeLone and McLean IS success model (DeLone and McLean, 2003)

When considering the factors of every model dimension, there are various considerations and empirical evaluations by different authors.

The *system quality* is, according to DeLone and McLean (2003, 2004), Chen and Cheng (2009), intended to measure technical (functional) success – the proposed factors are commonly reliability, responsiveness, flexibility; Nelson, Todd and Wixom (2005) also add accessibility and integration; Shin (2003) adds a system throughput etc.

Information quality, according to Chen and Cheng (2009), DeLone and McLean (2003), measures semantic success – factors commonly used in this dimension are accuracy, currency, relevance, completeness and consistency or understandability of information.

The *service quality* in works of DeLone and McLean (2003, 2004), Chen and Cheng (2009) and Wu and Wang (2006) reflects the importance of services and support in successful information systems – therefore they mention factors as reliability of service, efficiency of service staff or expertise of service staff.

Intention to use (which is seen as an attitude to use the system as it is) and *use* (which should measure to what extent the system is really used) are referred to as closely interrelated dimensions that are to be considered carefully, because of different attitudes of users to what the same system should do and what it really does depending on the users job position (Wu and Wang, 2006).

User satisfaction measures if the user is satisfied with the system as a whole and therefore it is determined by system, information and service quality (Wu and Wang, 2006; Chen and Cheng, 2009).

Net benefits is a dimension that, according to DeLone and McLean (2003), is composed of previously (in the 1992 D&M IS success model) featured dimensions individual and organizational benefits. After model revision in 2003 net benefits the dimension measures overall effectiveness of system usage; DeLone and McLean admits assessment using common financial measures (e.g. Total Cost of Ownership or Return on Investments etc.) but Wu and Wang (2006) emphasize assessment of net benefits as an abstract measure, since financial measures are dependent on particular situation, where the model is used applied. Factors especially proposed by DeLone and McLean (2003) are perceived task productivity, task innovation, customer satisfaction and management control (the extent to which the application helps to regulate work processes and performance).

4. Ontological assumptions for the application of the D&M IS success model for assessment of BI systems success

The D&M IS success model dimensions and their mutual relations show significant universality, and we therefore assumed that the same or similar dimension structure could be also applicable in our BI system success model proposal, but the factors that will characterize each dimension need to be properly assessed to ensure conformity with the BI systems success factors that stemmed of the literature review.

Analysis of the literature found numerous factors that determine success of a BI system from various points of view. However the original idea of D&M IS success was to provide model foundation for measurement of users' opinions on the defined dimensions. Other implications are left for consideration in particular practical evaluations of the model (DeLone and McLean, 2003). Therefore only individual factors that can be perceived according to an opinion of the BI system user are to be considered as viable for the set of success factors in our model proposal and so later considered for use as independent variables in regression analysis. Table 1 shows the structure of the set of factors formerly identified by the authors DeLone and McLean (2003, 2004) and also further research articles on the topic D&M IS success model evaluation (1st column) and in the 2nd column are our defined success factors that should be added to the model concept assessment in terms of a BI system success according to the literature review and analysis.

D&M IS success model factors	Our proposed addition to success factors in the model
Information quality	
accuracy	
currency	
relevance	
completeness and consistency	
understandability (format)	
System quality	
system reliability	ability to locate data
flexibility (adaptability to changes)	ability to view data context (access to metadata)
system throughput	proper level of detail (granularity of underlying data)
responsiveness	data quality
accessibility	security
integration	
portability	
Service quality	
reliability of services	extent of end-user training

efficiency of service staff	communication during system adjustment to changes
expertise of service staff	
Intention to use (attitude to use)	
no particular factor suggestions found	users actually need the BI
	proper methods of motivation to use BI tools used
Use (actual use)	
frequency of use	users cooperate on further BI projects
time of use	
number of accesses	
usage pattern	
job/decision making performance	
User satisfaction (no particular success factor suggestions found and also proposed)	
Net benefits	
task productivity	decision-making relevance
task innovation	
customer satisfaction	
management control	

Table 1 Success factors assumptions of our BI system success assessment model proposal against the original D&M IS success model (by DeLone and McLean, 2003).

Relations between dimensions are considered similar, as the Business Intelligence system is commonly a vital part of complex information system architecture, only factors that measure success in particular dimensions need some additions, as proposed in table 1.

The specified list of both original and additional success factors will be then used for assessment of internal relationships between dimension through empirical study and evaluation of the proposed model.

5. Conclusion and further research progress

The article presented an overview of information system success assessment using DeLone and McLean model as a theoretical concept and current review results of our ongoing research project. Theoretical concept of the model was used to conceptualize a proposal of BI systems success model components and the defined relations between the dimensions of the model. The model concept will be empirically assessed in next phase of the research project schedule, which should be accomplished through a survey that will be run in companies across different specified branches. The collected data will then be statistically tested using mainly factor analysis, regression analysis and analysis of correlations. If the concept is proofed, it can serve then as a theoretical foundation for further researches in the field of Business Intelligence system success assessment or as a base for conceptualization of a software solution for the automatization of continual or incremental assessment of BI system in terms of establishing its success.

LITERATURE

DELONE, W. H., MCLEAN, E. R. *Measuring success: applying the DeLone & McLean information systems success model*. International Journal of Electronic Commerce, vol. 9, issue 1, 2004, pp. 31 – 47.

DELONE, W. H., MCLEAN, E. R. *The DeLone and McLean model of information system success: a ten-year update*. Journal of Management Information Systems, vol. 19, issue 4, 2003, pp. 9 – 30.

CHEN, CH. D., CHENG, CH. J. *Understanding consumer intention in online shopping: a respecification and validation of the DeLone and McLean model*. Behaviour & Information Technology, vol. 28, issue 4, 2009, pp. 335 – 345.

NELSON, R. R., TODD P. A., WIXOM B. H. *Antecendents of Information and System Quality: An Empirical Examination Within the Context of Data Warehousing*. Journal of Management Information Systems, vol. 21, issue 4, 2005, pp. 199 – 235.

SHIN, B. *An Exploratory Investigation of System Success Factors in Data Warehousing*. Journal of the Association for Information Systems, vol. 4, 2003, pp. 141 – 170.

WU, J.-H., WANG, Y.-M. *Measuring KMS Access: A respecification of the DeLone and McLean's model*. Information & Management, vol. 43, 2006, pp. 728 – 739.

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