Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2011 Proceedings - All Submissions

8-6-2011

Towards a Life Cycle Oriented Business Intelligence Success Model

Barbara Dinter
Chemnitz University of Technology, barbara.dinter@wirtschaft.uni-chemnitz.de

Christian Schieder
Chemnitz University of Technology, christian.schieder@wirtschaft.uni-chemnitz.de

Peter Gluchowski
Chemnitz University of Technology, peter.gluchowski@wirtschaft.uni-chemnitz.de

Towards a Life Cycle Oriented Business Intelligence Success Model

Barbara Dinter
Chemnitz University of Technology
barbara.dinter@wirtschaft.uni-chemnitz.de

Christian Schieder
Chemnitz University of Technology
christian.schieder@wirtschaft.uni-chemnitz.de

Peter Gluchowski
Chemnitz University of Technology
peter.gluchowski@wirtschaft.uni-chemnitz.de

ABSTRACT

Information System (IS) success has been an essential research issue in the IS community for nearly two generations of IS researchers. For the Business Intelligence (BI) domain we see the lack of a comprehensive, life cycle oriented success model. Based on an extensive review of BI success related literature, we propose a methodology for creating such success models in general and demonstrate the feasibility of the proposed approach within the context of BI. A life cycle oriented BI success model is presented including an outline of the constructs, their relationships, and associated measurement items. From a practical perspective, the results provide assistance for the future development of BI solutions in organizations. The paper deepens the understanding of success model adaptation and extension from a theoretical perspective.

Keywords (Required)

Business Intelligence, Business Intelligence Success, Information Systems Success, Critical Success Factors

INTRODUCTION

For more than a decade a wide range of enterprise decision support solutions have been discussed under the umbrella term Business Intelligence (BI) (Clark, Jones and Amstrong, 2007). Therefore, it is rather surprising that until now, nobody has proposed a dedicated and generally accepted model for measuring the success of BI solutions (Lönnqvist and Pirttimäki, 2006). This remains the case despite the fact that CIOs have assigned the highest priority to BI year after year (Luftman and Ben-Zvi, 2011), and that BI concepts, tools, and software systems have contributed fundamentally to shape enterprise decision support (Alter, 2004). Current technological and conceptual innovations (such as in-memory databases and service-oriented BI) which have multifaceted, general effects upon enterprises further emphasize this diagnosis. In order to determine appropriate development paths for the future, it is therefore essential to analyze and evaluate the success of existing BI solutions in organizations. However, because the impact of information systems (IS) is often largely intangible (Urbach, Smolnik and Riempp, 2009), purely budgetary estimations of IS success that rely on a quantitative comparison of cost versus benefit are bound to fail, or are incomplete at best. This is especially the case with respect to BI (Lönnqvist and Pirttimäki 2006).

Hence, the purpose of our paper is twofold: on the one hand, we aim at guiding the development of domain specific success models in general. On the other hand, we develop a BI success model following the methodology we suggest. Our approach ensures the incorporation of system (run) success as well as system implementation success factors into a single model. A (later) validation of the model would reveal the areas with the highest impact on BI success, thus assisting organizations on decisions of resource allocation. Such an understanding is required to guide organizations in their efforts of building and maintaining BI systems. For instance, a confirmed measurement model would provide checklists of items which should be considered when designing BI solutions. As a vision a benchmarking tool for BI solution is conceivable as it would allow organizations to understand the maturity of their solution in comparison to competitors. From a theoretical perspective our contribution adapts and extends the updated DeLone and McLean (2003) IS success model to the important domain of BI. Moreover we outline a development methodology for the creation of domain-specific, life cycle oriented IS success models. Accordingly, the remainder of the paper is structured as follows: in the following section we give a review of state-of-the-art of IS and BI success. Then we elaborate the design of domain-specific success models. Subsequently we demonstrate the feasibility of our general approach in the context of BI by developing a BI specific success model. Finally, we point out the limitations of our results and conclude the paper with a description of the implications of our findings for future research.

FOUNDATIONS

IS success

A large amount of empirical studies explore the nature of IS success (for an overview we refer to Urbach et al. 2009). IS success is an elusive phenomenon that can only be explained in terms of a multidimensional construct (Rockart, 1982). According to Molla and Licker (2001) the multiple dimensions forming this IS success construct span different socio-systemic levels, such as technical, individual, group, and organizational levels with various groups of stakeholders having different versions of their view on what makes a successful IS. Many researchers have consolidated prior work in form of a comprehensive IS success model. E.g.. Rai, Lang and Welker (2002) present an empirical test of two widely used IS success models: DeLone and McLean's (1992) IS success model (updated in 2003) and Seddon's (1997) IS success model. Both models have attracted considerable attention as methods for assessing IS success. Other models have been proposed such as the IS-Impact measurement model (Gable, Sedera and Chan, 2010) or Davis' technology acceptance model (TAM) (Davis 1989). Each model emphasizes different aspects of IS success.

Judged by its frequent citations in leading journals, the DM model has become the dominant success evaluation framework in IS research (Urbach et al. 2009). Using a comprehensive taxonomy of heterogeneous concepts drawn from literature, DeLone and McLean (1992) clustered the definitions and measures into six categories for conceptualizing a multidimensional measurement model with interrelated constructs to explain IS success. Several empirical analyses have confirmed the correlation between these dimensions for the original DM model (Rai et al., 2002). Consequently, respecification and operationalization have been recommended for many specific IS domains (DeLone and McLean, 2003, see also Urbach et al., 2009). On the other hand some authors have identified shortcomings and claimed that the DM model is incomplete and would need more dimensions (Seddon 1997). DeLone and McLean (2003) themselves presented an updated model in order to address those concerns about the original model. It is illustrated in Figure 1.

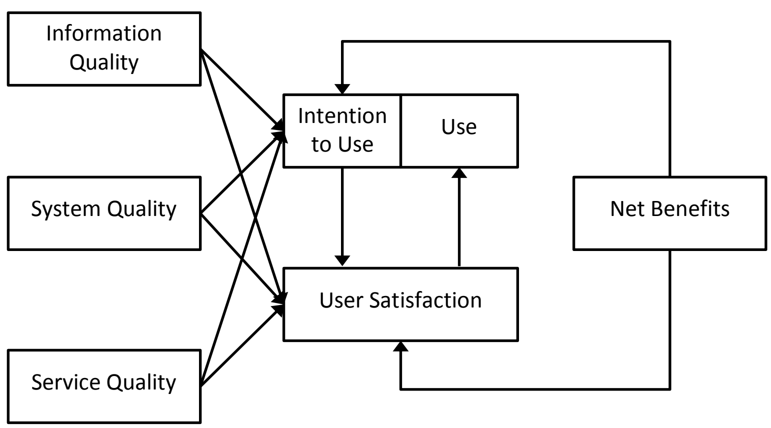

Figure 1. DeLone and MacLean's (2003) updated IS success model

BI success

Numerous success models have been contributed for specific domains, among others for the BI domain, particularly in recent years. Wixom and Watson developed in 2001, based on the aforementioned DM model, a data warehousing (DW) success model and validated it by empirical means (Wixom and Watson, 2001). This contribution has attracted significant attention in related publications, either in terms of citations or by serving as a foundation for further work. We conducted an extensive literature review, however, will reference here a selection of related and in our context relevant work only due to space limitations. Table 1 includes the references, which domain is addressed, how the research model is validated, if success is represented in a multidimensional manner, and if the success model is based a) on the DM model and b) the aforementioned model of Wixom and Watson.

Reference	Domain	Evaluation	Mulitidimensio-nality of success	Based on DM model	Based on Wixom/Watson
AlMabhouah and Ahmad, 2010	DW	No	Yes	Yes	No
Hartano, Santhanam and Holsapple, 2007	MSS	By literature	Yes	Yes	No
Hawking and Sellitto, 2010	BI	No	N.a.	No	No
Hwang, Ku, Yen and Cheng, 2004	DW	Empirical	No	No	No
Nelson, Todd and Wixom, 2005	DW	Empirical	Yes	Yes	Partially
Quaing, 2010	BI	Empirical	Yes	Yes	No
Schieder and Gluchowski, 2011	BI	No	Yes	Yes	Partially
Shin, 2003	DW	Empirical	Yes	Yes	No
Taskov, 2009	BI	Empirical	N.a.	No	No
Yeoh and Koronis, 2010	BI	Case studies	Yes	Partially	No

Table 1. Related work for BI success

For a more detailed discussion of previous BI success research and its shortcomings we refer to the forth section.

DEVELOPMENT OF A DOMAIN-SPECIFIC SUCCESS MODEL

Despite many contributions about domain-specific success (factors) we believe that there is still a research gap that has to be filled regarding this research topic. Following, we derive the requirements which lead to a methodology for the development of domain-specific success models.

Requirements for the success model scope

The requirements (R1 to R3) refer to the scope of a success model and can be regarded as domain independent and consequently apply to others than the BI domain (such as knowledge management, customer relationship management, e-commerce, etc.), too.

- (R1) Consideration of the complete system life cycle
  To ensure IS quality (and success) the whole system life cycle has to be taken into account. In other words, key success factors for the planning and building stages require same attention as for operations (run stage). In the case of BI, the majority of projects fail due to inadequate planning, poor project management, and undelivered business requirements (Moss and Atre, 2003). Hawking and Sellitto (2010) identify in a comprehensive review and consolidation of practitioner experiences in BI projects success factors for the various life cycle stages.
- (R2) Consideration of the updated DM model
  We consider the DM model as an adequate foundation for the design of a domain specific success model due to its multidimensional success representation. In particular, the updated DM model (2003) can address certain domains in a way more suitable for their characteristics. For example, the introduction of service quality corresponds to current trends in BI where service and customer orientation gain increasing relevance.
- (R3) Comprehensiveness
  The success model should be characterized by a broader scope that does not only emphasize system-related (and corresponding IT) aspects, but rather examines the strategic, organizational, and implementation aspects in an integrated way (Alter, 2004; Clark et al., 2007; Dinter, Lahrmann and Winter, 2010).

Methodology for the development of domain specific success models

Before we develop the BI success model in detail in the following section, we illustrate how the underlying methodology can be applied in general. According to requirement (R2) the updated DM model is used as the starting point. Its domain specific modification can be conducted by means of two mechanisms:

(1) Adaptation of the DM model

Although the DM model is intended to be valid for IS in general, DeLone and McLean themselves recommend to adapt the research model for specific domains to better address their characteristics. Such an adaptation can be handled by a) an adaptation of the success constructs and / or b) an adaptation of measurement items within each success construct. In both cases the adaptation can be conducted by addition, deletion, or modification of constructs or items, respectively.

(2) Extension of the DM model

To broaden the scope of the success model it can be useful to extend the DM model by further constructs, in particular, by antecedents that have causal relationships to constructs within DM model. In order to address requirement (R1) antecedents representing the implementation success (and the plan and build stages, respectively) should be modelled in such a way that they constitute causal relationships to the DM quality constructs (information / system / service quality). Such an extension is motivated by the demand for guiding organizations in IS projects. They need advice what (critical) success factors will support the planning and implementing of IS with the purpose of successful IS implementations which again will cause the overall system success. An extended DM model can help to determine and confirm those success factors.

Scanning previous research makes evident that most approaches follow one of the two techniques, but only very few both. Figure 1 illustrates the mechanisms:

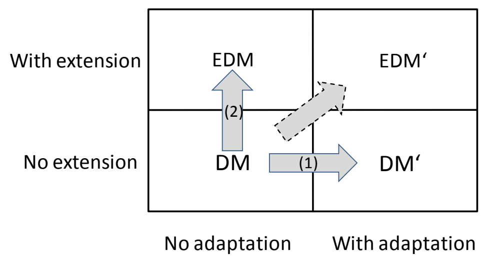

Figure 2. Development of domain specific success models

Examples for the upper left quadrant and for the lower right quadrant are referenced in Table 1 and below. In the case of BI, to the best of our knowledge very few success models (e.g. Wixom and Watson, 2001) can be allocated in the upper right quadrant. This success model, however, is based on the original DM model and does not meet all BI related requirements as they will be derived in the following section.

DEVELOPMENT OF THE BI-SPECIFIC SUCCESS MODEL

In this section we apply the aforementioned methodology within the BI domain in order to a) develop a BI specific success model and b) to evaluate the feasibility of our approach.

Methodology for the development of domain specific success models

Before conducting the adaptation we derive the requirements representing BI characteristics. Most requirements result from the main purpose of BI which is supporting decision making on all organizational levels.

- (R4) Flexibility
  Due to its embedding in dynamic and fast changing environments, requirements for BI solutions change frequently and are predictable to a certain extent only. Consequently, BI systems should be designed and implemented in a way that allows to respond to those changes fast and with little effort (Clark et al., 2007). This requirement applies to system architecture as well as to content- and presentation-related aspects.
- (R5) Heterogeneous user groups
  BI is aimed to support all kind of decisions in an organization with rather heterogeneous user groups. User groups range from top management to operational level, across various functional areas, and include users with different experience level (power users, standard users, etc.) (Alter, 2004).
- (R6) Business involvement
  BI projects are characterized by high business involvement. In many organizations business engagement applies to all (or to most) life cycle stages, i.e. planning, implementing and running BI solutions.
- (R7) Strategic alignment
  BI solutions interact with corporate strategy in several ways. The main purpose of BI systems is to support corporate goals at the best and to meet all business requirements. On the other hand the strategic importance of BI is recognized. Both aspects should be considered in (mutual) organizational alignment (Hawking and Sellitto, 2010).

BI success work reviewed

In the face of the aforementioned requirements for a BI success model previous research seems to not meet all of them which in particular applies to (R1) and (R2). To the best of our knowledge, apart from Quaing (2010) no approach uses the updated DM model as a foundation for BI success (R2). Even the original DM model is referenced only by few authors, such as AlMabhouah and Ahmad, 2010; Hartano et al., 2007; Wixom and Watson, 2001. In addition, some authors (e.g. Hwang et al., 2004) regard success not in a multidimensional way resulting in a restricted view without consideration of interrelationships between various success facets.

As discussed in requirement (R1) a BI success model should take into account all life cycle stages. However, the DM model addresses primarily the run stage as it starts with "IS success", i.e. with an existing IS and focuses on its use (and therefore on the operations of the system). One option to meet (R1) was introduced in (Wixom and Watson, 2001). The authors distinguish the "layers" implementation factors, implementation success (both layers represent an extension to the DM model) and success model (which constitutes an adaptation of the original DM model) and hypothesize and verify causal relationships between these layers. The implementation factors (such as management support, resources, and team skills – cf. Wixom and Watson, 2001) can be considered as success factors to be taken into account when planning and building BI systems – in other words, focusing on these factors leads to higher implementation success. We consider the approach of Wixom and Watson as very suitable to represent all system life cycle stages in a success model (not only in BI context). Consequently, we make use of this idea when developing our model below.

The fulfilment of (R3) varies within the publications, although the majority seems to follow a comprehensive perspective for success aspects. Due to space limitations we leave a detailed discussion how BI characteristics ((R4) to (R7)) are addressed by previous work. Some examples how these contributions should be extended due to (R4) to (R7) can be found in the exemplary adaptation of success constructs in the BI context as described in second last section. However, the development of a new BI success model is already motivated by the shortcomings with regard to requirements (R1) and (R2).

BI-specific adaptation of the IS success model

DeLone and McLean (2004) illustrate the application of their generic IS success model exemplarily for e-commerce environments. They show that to a large extent generic IS success measures are suitable, but differ greatly in their relative importance within this specific domain compared to general IS success measures. Following their approach we examine the six DM success constructs if and how they apply to the BI context and sketch their operationalization.

(1) *System quality*, in the context of BI, encompasses all BI system-related properties and addresses in particular the degree, to which user requirements regarding the BI solution are met (Wixom and Watson, 2001). Responsiveness, reliability, and functionality are further system properties of high value for BI users. Due to the need to conduct complex analysis, factors of ergonomics (usability, user guidance, presentation) become vital and gain importance compared to other domains.

(2) *Information quality* summarizes measures to assess content-related aspects of BI. BI content, i.e. analytical information, should be accurate, complete, up-to-date, and easy to understand. Information quality has been addressed extensively in BI-related research such as Data Warehousing (Nelson et al., 2005; AlMabhouah and Ahmad, 2010), resulting in comprehensive collections of measures, many of which are likewise relevant for BI.

(3) *Service quality* relates to quality issues with regard to support users when utilizing the system. Common quality measures are availability and responsiveness of supporting staff. In the BI context the construct gains further relevance because of the apparent complexity of BI solutions. Subsequently, service orientation with regard to BI consumers implies specific challenges for organizations, not only concerning empathy and (process and technical) expertise of support staff, but also the ability to define BI services addressing user demands even proactively.

(4) *(Intention to) Use* measures the type, scope and intensity of the utilization of the BI solution. The extent to which users utilize reports and analytical functions of BI systems are examples for relevant measures. In addition, the percentage of active users and the extent to which analytical information is used in operational processes can become important indicators (Marjanovic, 2010).

(5) *User satisfaction* analysizes the users' attitude towards the system. The construct measures the quality characteristics as perceived by the users. A central concern is the user experience with the system compared with their expectations. Questions whether the users feel assisted in their decision processes or whether they like using the system capture the relevant user attitudes.

(6) *Net benefits* are significant success measures, as they capture the balance of positive and negative impacts of BI with regard to different stakeholders groups (DeLone and McLean, 2004). A diverse set of interrelated aspects constitute stakeholder-specific benefits. For example, positive effects for organizations include productivity increases as well as potential improvement in transparency, degree of business understanding, and traceable fulfillment of regulatory requirements (Yeoh and Koronis, 2010). Acceleration and enhancement of decision-making processes in terms of reducing decision-making latency, i.e. the time between the occurrence of a need for a decision and the decision being made and then implemented, further increase the agility of organizations (Marjanovic, 2010).

Summarizing, all constructs as introduced in the updated DM model, can be used in the BI context as well. Due to space limitations we illustrate the results of the operationalization for BI for the system quality construct only. Table 2 lists exemplarily the metrics for the assessment of the system quality construct regarding BI success. We checked in BI related literature which IS success measures as collected by DeLone and McLean (1992; 2004) are supported in the BI context as well. Table 2 includes in the first column the resulting consolidated measures. For better understanding and for the concrete formulation of the corresponding items the second column enumerates the relevant facets for each measure. Finally, the table lists the related work supporting the measures, enriched by the information if a measure was confirmed in previous work empirically (denoted as (e)) or conceptualized / theoretically deducted (denoted as (c)).

BI system quality measure	**Facets of measurement**	**BI-related sources**
Ergonomics	Usability, presentation, user guidance, ease of navigation	Shin, 2003 (e); Marjanovic, 2010 (c); AlMabhouh and Ahmad, 2010 (c); Quaing, 2010 (e)
Responsiveness	System responsiveness, response time, query execution time	Nelson et al., 2005 (e); Marjanovic, 2010 (c); Shin, 2003 (e); Quaing, 2010 (e)
Flexibility	Adaptability, scalability, customization, personalization	Wixom and Watson, 2001 (e); Nelson et al., 2005 (e);
Security	Secure transactions, privacy, access authorization	Shin, 2003 (e)
Integration	Interaction with other systems, integration of heterogeneous data sources	Wixom and Watson, 2001 (e); Nelson et al., 2005 (e); Isik, 2009 (c); Marjanovic, 2010 (c)

Table 2. BI system quality measures

Each of the remaining five constructs would be operationalized in a similar way. After the complete adaptation of the updated DM model (which addresses the “run” / operations stage of BI systems) we extend in a second step the success model by incorporating antecedents to take into account the plan and build stages, too (cf. requirement (R1)).

BI-specific extension of the IS success model

As explicated in the methodology for the development of domain-specific success models, we suggest additional constructs that address implementation success and its antecendents. Two different approaches can be found in literature for extending the DM model with antecedents. Some authors, such as (Hwang and Xu, 2007; Ariyachandra and Frolick, 2008) develop success factors constituting direct causal relationships to the DM model constructs, mainly to the system / information / service quality constructs. Others (e.g. Wixom and Watson, 2001; Hartono et al., 2007) introduce a dedicated implementation (or similar) success layer. In our opinion the second approach better reflects the relevance of this layer and provides more explanatory power for causal interrelationships between the life cycle stages plan / build / run.

Consequently, we elaborate in a first step the implementation success “layer”. With respect to requirement (R3) this layer encompasses a broad scope. Several authors perceive implementation success as a multidimensional construct (Wixom and Watson 2001; Hartono et al., 2007) and propose rather similar constructs. In line with the findings of Dinter and Goul (2011), who distinguish three fundamental dimensions to describe the BI domain, we propose a threefold structure of implementation success with three corresponding success constructs.

(1) *Organizational implementation success (OIS)* relates to the question of how effectively the BI solution is integrated into the work system of an organization. A BI implementation is successful from an organizational perspective if it provides a strategic contribution (R7), e.g. enhances the competitiveness of an enterprise. OIS is positively influenced by formalized and standardized BI implementation processes which lead to predictable implementation cycles with

dedicated requirements engineering and the use of standardized software development process models. Furthermore, organizations are challenged to ensure acceptance of the BI solution by heterogeneous user groups throughout the enterprise (R5). OIS will impact all quality constructs (i.e. systems / information / service quality of the BI solution). For example, data homogenization and standardization as facets of OIS are supposed to have a positive impact on information quality.

(2) *Functional implementation success (FIS)* refers to the degree to which business requirements are met by the BI solution. FIS correlates with the correct transition of functional business requirements into technical specifications. To ensure this transition close business involvement in specification processes is required (R6). FIS is further indicated by the degree and quality of considering regulatory and legal requirements. From a functional point of view a BI implementation is successful if analytical methods and capabilities can be provided to users as needed and expected. Similar to OIS, FIS influences the quality constructs in many ways. For example, meeting functional requirements in the BI system will certainly lead to improved information quality and service quality.

(3) *Technological implementation success (TIS)* comprises factors related to technical components and the architecture of a BI solution. The technical complexity of a BI solution is a result of the high level of diversity in tools, source systems, and processes and the need to get them orchestrated. Further challenges arise from fast changing (R4) and different technical requirements of heterogeneous user groups (R5). The degree to which these technical obstacles are overcome affects system quality, information quality and service quality alike.

Once the constructs have been conceptualized, they need to be operationalized. We illustrate exemplarily the results of the operationalization for the organizational BI implementation success construct. In a first step we checked BI-related literature for implementation success measures concerning organizational aspects, analyzed the findings, and consolidated the results. Table 3 summarizes the results for OIS measures, includes the measurement facets, references the literature from which the measure has been extracted, and indicates which requirements are met by the measure.

OIS measure	Facets of measurement	BI-related sources	Requirement
Acceptance	Organizational and cultural change, political resistance	Wixom and Watson, 2001 (e)	R5
Contribution	Competitiveness, agility, strategic alignment	Watson and Wixom, 2010 (c); Dinter and Goul, 2011 (c)	R4, R7
Formalization	Standardization, robust operations, fixed responsibilities	Klesse and Winter, 2006 (c)	R6

Table 3. Organizational BI implementation success measures

After having specified the implementation success layer, its constructs, and measurement items, we need to identify the success factors that correlate with implementation success. Once again, we demonstrate our approach exemplarily by focusing on the success factors influencing organization implementation success.

Hawking and Sellitto (2010) identified a broad range of BI success factors. Using a content analysis of both, practitioner-oriented and scientific literature on critical success factors in enterprise resource planning (ERP) and BI implementations they compiled a list of 22 success factors. We selected from this source those success factors for which we hypothesize a causal interrelationship to OIS and complemented the list with factors referenced in other literature (e.g. Wixom and Watson, 2001; Yeoh and Koronios, 2010). The consolidated factors are: management support, strategic alignment, business involvement, change management, team skills, and resources. For a final and comprehensive operationalization certainly further related literature would have to be taken into account.

Summarizing our elaborations on a comprehensive BI success model, we depict the constructs and their hypothesized causal relationships in Figure 3. On the right-hand side the updated DM model is presented. The left-hand side includes the extensions: (1) A selection of the BI implementation success factors; in this case exemplarily the success factors for organizational implementation success (the final success model would include further success factors for the functional and technical implementation constructs and all corresponding relationships) and (2) the implementation success layer, constituted by the functional, technical and organizational implementation success constructs.

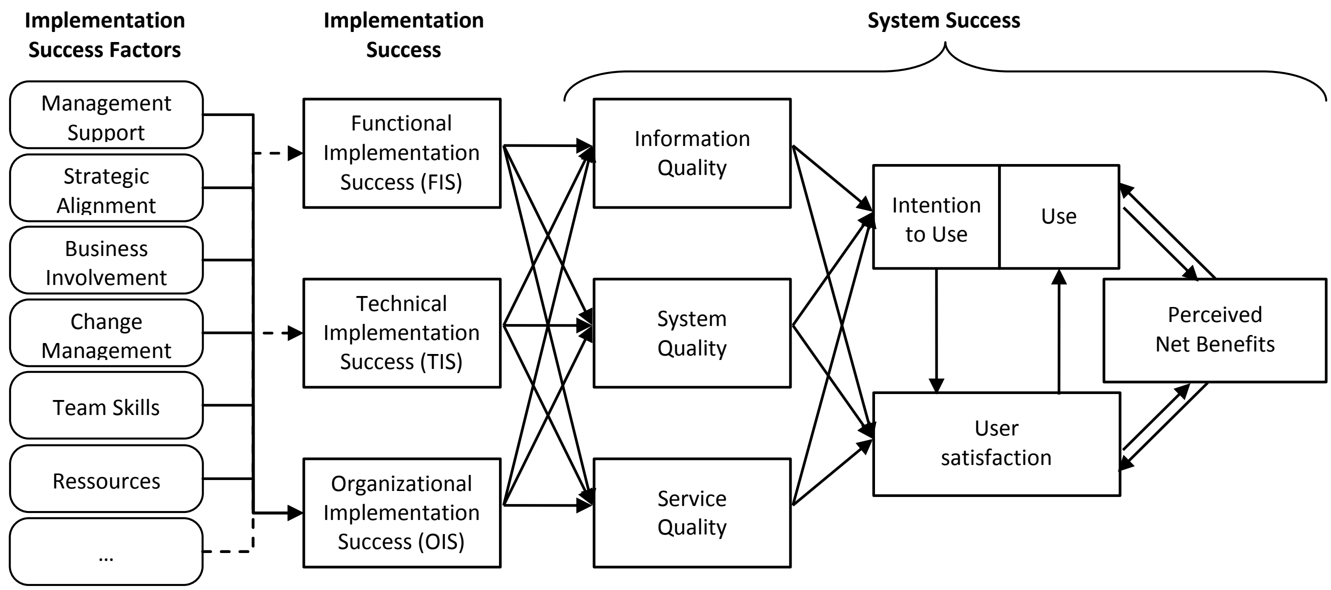

Figure 3. The resulting BI success model

CONCLUSION AND FUTURE WORK

In the paper at hand we presented a methodology to develop domain-specific success models based on the updated DM model. We evaluated our approach by applying the methodology to the BI context. Due to space limitations we could not develop the whole success model within this paper but sketched all steps for the setup of the research model exemplarily. Although we were able to lay out the constructs in some detail, these modifications to existing construct measurement models and the introduction of new constructs make an extensive validation phase necessary (Straub et al. 2004). The validation of the final BI success model is subject to future work. The results of such empirical analysis will gain insights for organizations how to create successful BI systems and how to assess them. The life cycle oriented approach ensures that the timely anticipation of potential project risks allows interventions in the early implementation stage. Consequently, organizations implementing BI will receive guidance where to pay their attention to when conducting BI projects. Also enterprises operating BI solutions might be enabled to assess the current state of their BI system landscape and might be supported in planning future development paths.

REFERENCES

1. AlMabhouh, A., & Ahmad, A. (2010). Identifying Quality Factors within Data Warehouse. *Proceedings of the 2nd International Conference on Computer Research and Development*, November 2-4, Cairo, Egypt, 65-72.
2. Alter, S. (2004). A work system view of DSS in its fourth decade. *Decision Support Systems*, *38*(3), 319-327.
3. Ariyachandra, T., & Frolick, M. (2008). Critical Success Factors in Business Performance Management – Striving for Success. *Information Systems Management*, *25*(2), 113-120.
4. Clark, T., Jones, M., and Armstrong, C. (2007). The dynamic structure of management support systems: theory development, research focus, and direction. *MIS Quarterly, 31*(3), 579-615.
5. Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly 13*(3), 318-340.
6. DeLone, W.H., & McLean, E.R. (1992). Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, *3*(1), 60-95.
7. DeLone, W.H., & McLean, E.R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, *19*(4), 9-30.
8. DeLone, W.H., & McLean, E.R. (2004). Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model. *International Journal of Electronic Commerce*, *9*(1), 31-47.
9. Dinter, B., & Goul, M. (2010). The Impact of National Culture on BI Maturity Models. *Proceedings of the International Conference on Information Systems, December 12-15, St. Louis, MO, USA.*

10. Dinter, B., Lahrmann, G., & Winter, R. (2010). Information logistics as a conceptual foundation for enterprise-wide decision support. *Journal of Decision Systems, 19*(2), 175-200.
11. Gable, G. G., Sedera, D., & Chan, T. (2010). Re-conceptualizing information system success: the IS-Impact Measurement Model. *Journal of the Association for Information Systems*, *9*(7), 377-408.
12. Hartono, E., Santhanam, R., & Holsapple, C. (2007). Factors that contribute to management support system success: An analysis of field studies. *Decision Support Systems*, *43*(1), 256-268.
13. Hawking, P., & Sellitto, C. (2010). Business Intelligence (BI) Critical Success Factors. *Proceedings of the Australian Conference on Information Systems*. December 01-03, Brisbane, Australia.
14. Hwang, H., Ku, C., Yen, D., & Cheng, C. (2004). Critical factors influencing the adoption of data warehouse technology: a study of the banking industry in Taiwan. *Decision Support Systems*, *37*(1), 1-21.
15. Hwang, M. I., & Xu, H. (2007). The effect of implementation factors on data warehousing success: An exploratory study. *Journal of Information, Information Technology, and Organizations*, *2*(2007), 1-16.
16. Klesse, M., & Winter, R. (2007). Organizational Forms of Data Warehousing: An Explorative Analysis. *Proceedings of the HICSS-40*, Los Alamitos.
17. Lönnqvist, A., & Pirttimäki, V. (2006). The Measurement of Business Intelligence. *Information Systems Management*, *23*(1), 32-40.
18. Luftman, J., & Ben-Zvi, T. (2011). Key issues for IT executives 2010: Judicious IT Investments Continue Post-Recession. *MIS Quarterly Executive*, *9*(1), 49-59.
19. Marjanovic, O. (2010). The Importance of process thinking in Business Intelligence. *International Journal of Business Intelligence Research*, *1*(4), 29-46.
20. Molla, A., & Licker, P. (2001). E-commerce systems success: An attempt to extend and respecify the Delone and Maclean model of IS success. *Journal of Electronic Commerce Research*, *2*(4), 131-141.
21. Moss, L., & Atre, S. (2003). Business Intelligence Roadmap – The Complete Project Lifecycle for Decision-Support-Applications. Addison Wesley, Amsterdam.
22. Nelson, R. R., Todd, P. A., & Wixom, B. H. (2005). Antecedents of Information and System Quality: An Empirical Examination within the Context of Data Warehousing. *Journal of Management Information Systems*, *21*(4), 199-235.
23. Quaing, B. (2010). Einsatz und Nutzen von Business Intelligence in Unternehmen – Ergebnisse einer kausalanalytischen Untersuchung. Dr. Kovac, Hamburg. (In German)
24. Rai, A., Lang, S.S. & Welker, R.B. (2002). Assessing the Validity of IS Success Models: An Empirical Test and Theoretical Analysis. *Information Systems Research 13*(1) 50-69.
25. Rockart, J. F. (1982). The changing role of the information systems executive: A critical success factors perspective. *Sloan Management Review*, *24*(1), 3-13.
26. Schieder, C. & Gluchowski, P. (2011). Towards a Consolidated Research Model for Understanding Business Intelligence Success. *Proceedings of the 19th European Conference on Information Systems*, June 09-11, Helsinki, Finland.
27. Seddon, P. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research, 8*(3), 240-253.
28. Shin, B. (2003). An exploratory investigation of system success factors in data warehousing. *Journal of the Association for Information Systems*, *4*, 141-170.
29. Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation Guidelines for IS Positivist Research. *Communication of the AIS*, *13*, 380-427.
30. Taskov, K. (2009). Factors Contributing to an Effective Business Intelligence Product. *Proceedings of the 15th Americas Conference on Information Systems*, August 06-09, San Francisco, CA, USA.
31. Urbach, N., Smolnik, S., & Riempp, G. (2009). The State of Research on Information Systems Success. *Business & Information Systems Engineering*, *1*(4), 315-325.
32. Wixom, B. H., & Watson, H. J. (2001). An empirical investigation of the factors affecting data warehousing success. *MIS Quarterly*, *25*(1), 17-41.
33. Yeoh, W., & Koronios, A. (2010). Critical Success Factors for Business Intelligence Systems. *Journal of Computer Information Systems*, (Spring 2010), 23-32.