Adapting the DeLone and McLean Model for the Enterprise Architecture
Benefit Realization Process

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Abstract

Enterprise Architecture (EA) approach has been widely used for managing the complexities and changes in organizations and their business environments. However, research on potential benefits of the approach is rare and lacks strong empirical evidence. In this paper, we adapt the DeLone and McLean Model of Information Systems Success for describing the EA benefit realization process. Accordingly, we scrutinize seven constructs contributing to EA benefit realization. Each construct is approached from four viewpoints namely process, product, outcome and impact. Perceptions on describing the constructs in the EA context are presented with an example of how our adapted model can be used in organizations. The results form a basis for further research and discussion, and are also a step toward cumulative tradition in EA research.

1. Introduction

Organizations today are applying Enterprise Architectures (EA) for managing the complexity of organizations’ structures, information technology (IT) and business environments, and facilitating the integration of strategy, personnel, business and IT [12, 14, 19, 23]. EA includes architectural models needed in managing and developing the organization, encompassing the viewpoints of business, information, information systems (IS) and technology [17, 18, 21]. It describes the current architecture of the organization, provides a vision of a future architecture and a transition plan describing how to reach it [3, 21].

However, as with any organizational initiative, also EA has to be justified by demonstrating its positive impacts to the organization [23]. This is emphasized as EA initiatives typically require substantial investments [18]. Even though it is claimed that EA has the potential to produce significant benefits [17, 18, 23], strong empirical evidence has yet to be presented [24]. This lack of data might be caused not only by the novelty of the topic but also by its constant change – making the measurement of EA effects extensively difficult [23]. Furthermore, no generic, validated theory or model for describing the realization of benefits from EA has been introduced.

In this exploratory study, we scrutinize how the DeLone and McLean model of IS success [8] can be used to describe the EA benefit realization process. Such a process is defined as a sequence of constructs that contribute to the realization of benefits from EA. First, we define each of the DeLone and McLean model constructs in the EA domain and second, demonstrate how the model can be used by describing a real-life EA initialization case. Consequently we aim at identifying the first steps in tailoring the model to the EA domain so that they form a basis for formalizing the model and depict some issues to consider when assessing the EA benefits and establishing such initiatives. Our approach helps the benefit realization by illustrating the scope of EA and providing tools to narrow it down to meaningful range.

Our approach is based on the fact that the DeLone and McLean model originates from generic communication and information influence theories [22, 31], being validated in several domains [e.g. 9, 15, 20, 30], consequently making it sufficiently versatile to be used in the EA context as well. However, since the concept of EA is extensive and somewhat ambiguous, we consider the original model in its current form to be insufficient and incomplete to accommodate the whole concept of EA. Therefore, we approach each of the constructs from four different viewpoints; process, product, outcome and impact, that are described in details later in chapter 2.
• **Processes** comprise a set of EA planning, development and management processes [3, 21, 26].

• **Products** include models and principles depicting the current and future state of an organization, complemented by certain services [2, 21, 33].

• **Outcomes** (implementations) result directly from the use of EA products and services, featuring e.g. information systems constructed according to EA products.

• **Impacts** from EA, such as benefits, may arise directly from EA processes, products and services, implementations, or indirectly through the applicability of direct benefits.

The paper is organized in the following way. First, theoretical background is presented. Second, the DeLone and McLean model is described. Third, the model is brought into the EA context. Fourth, an example to clarify the use of the adapted model is portrayed. The paper ends with discussion and conclusion chapters.

2. Theoretical Background

Currently a large amount of EA research focuses on the planning and development aspect of EA: frameworks [e.g. 32, 33], planning and developing methods and tools [e.g. 5, 21], and development processes [e.g. 3, 26, 33]. Critical success factors and maturity models have gained less attention [c.f. 34, 35, 36]. Typically, maturity models can be used to attain a high-level view of the quality of the process and product viewpoints of EA in an organization, i.e. what success factors have been taken into account in EA development and management and how comprehensively. They do not include comprehensive instruments for evaluating EA benefits.

There are only a few studies addressing the potential benefits or the value of EA [e.g. 19, 23], i.e. the situations before EA development initiatives have started. Although some studies have been conducted [e.g. 14, 28], they are often theoretical, lacking strong empirical evidence [24]. Studies on the theoretical foundations of EA, including comprehensively defining the different viewpoints of EA, i.e. processes, products, services, implementations, impacts and their interrelations, and the use of EA products are rare. Yet the importance of EA has been emphasized [23, 34] also in industry where a great number of anecdotal evidence on the practical business value and utilization of EA exists.

The domain of EA is not extraordinary when attempting to display benefits. Historically, the same issues have been encountered in the IS domain [7, 8, 11]. A multitude of models have been developed in order to describe and measure the IS success – the realization of benefits or value of IS [7, 8, 10]. Especially the DeLone and McLean models (both original and updated) [7, 8] have been widely used and validated (e.g. Google Scholar finds over 1300 citations).

The DeLone and McLean model is designed for the IS domain. It is based on generic communication and information influence theories [see 22, 31]. This generality suggests the model to be usable in characterizing any process, making it applicable to other contexts. In fact, in addition to IS context, the model has already been adapted and validated in e-business [9], knowledge management [20], e-learning [15], business processes [30], and websites [29]. Also the definitions of IS and EA indicate that the model can be used in the EA domain. Information systems are defined as being an organized collection of IT, data and information, processes and people [13] while EA is seen as a collection of principles, methods and models that holistically describe the entire organization [21]. The EA description includes the abovementioned components of IS.

The EA domain would benefit from the success model when trying to unify the concept of EA benefit realization. So far only some ideas of components of the realization process have been suggested [e.g. 19, 21, 23]. To gain an overview of and understanding about the process, the nature of EA has first to be understood and defined. First, **EA is a product** including principles and models depicting the current and future state of an organization [3, 21]. The products may be complemented with various services, for instance EA guidance [2, 33]. Second, **EA is a process** [3, 17, 21, 26], more specifically a collection of planning, development and management processes.

**EA generates** various impacts to and within the organization [e.g. 17, 23]. Yet the studies do not differentiate from where the impacts actually arise. Alternatives include direct impacts from EA processes, or indirectly through the resulting products and services. However, DeLone and McLean [7, 8] suggested that benefits from information systems are generated through their use only. This argues for similar kind of approach in the EA domain. Indeed, as any architecture EA is used for implementing, for instance, organizational structures, processes, systems, applications, and services. The transformation towards the target EA is carried out through a set of development projects [18, 33]. This adds another potential source of **EA outcomes**: implemented EA.

There are also a variety of other uses for EA products and services. For instance, they can be used to support decision-making processes, change man-
agement, business process design, system development, and project planning and steering [6, 17, 33]. We consider also these to be the outcomes or implementations of EA as they involve the use of EA products and services.

Kluge et al. [19] adapted the DeLone and McLean model to the EA context. They used two case studies to provide an overview of the EA value realization process. However, their study reports only preliminary results discussing EA presentation and governance strategies and their effects on the value realization process. The problem, in our view, is the narrow consideration of the original success model: only the effects of presentation and governance strategies are discussed while the other constructs have been left intact.

3. The DeLone and McLean Model

The original DeLone and McLean IS Success Model [7] aims at examining and structuring the “dependent variable” in IS research – IS success. At the time the article was written, already a considerable amount of literature had been published on IS success and IS success measures. This myriad of different measures was (and still is) caused by the multidimensional nature of information: it can be measured on different levels, such as the technical, the semantic, and the effectiveness level [31]. Therefore, a need for a comprehensive view of IS success was highly appreciated.

The DeLone and McLean model is based on two complementary theories: communication theory [31] and information influence theory [22]. Communication theory considers information to be serial – it passes through a series of stages from its creation to the potential impact on the recipient [31]. Furthermore, for each stage different success measures may be applied [22]. By adding the additional information influence level to the levels of information, DeLone and McLean derived six categories of IS success, namely System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact. Subsequently, they used the categories to organize the research on IS success, identified potential variables (measures) for each category and for interdependencies between them, and finally, developed a descriptive model of IS success.

As the model shows, IS success is a multidimensional construct. DeLone and McLean (1992) thus suggested that individual measures should be selected from the IS success categories to create a comprehensive measurement instrument. All the constructs should be measured, or at least controlled, and any possible causal relationships between them should be taken into account. The measures and constructs should be selected according to the objectives of the measurement and its context, emphasizing tested and established measures. The number of measures should then be reduced to enable the comparison and validation of the results.

The model was not validated through empirical studies in the original article. However, since then considerable amount of research have been conducted to validate, criticize and develop the model. Later DeLone and McLean [8] produced an updated version utilizing the findings and critique. For example, a Service Quality construct was added and the Use construct divided into Intention to Use and Use constructs. Also Individual Impact and Organizational Impact constructs were combined into a simpler Net Benefits construct. Figure 1 illustrates the updated version of the model.

4. The DeLone and McLean Model in the EA Context

Next the adaptation of the DeLone and McLean model to the EA context is discussed.

4.1. Information Quality

The Information Quality construct measures the output of an IS [7]. Typically this is the information produced by the system. Attributes such as accuracy, timeliness, completeness, relevance and consistency of information are found to be relevant measures [8].

- **Product.** In the EA context, the closest equivalent for information produced by an IS is the information produced by EA processes, i.e. EA artifacts. The construct measures the quality of EA artifacts, meaning EA principles and models [21]. The quality of EA artifacts can be defined, for instance, by four character-
istics: stakeholder and purpose orientation, quality of content, quality of presentation, and the management of documentation [16]. This emphasizes the EA product viewpoint rather than the process viewpoint since EA artifacts are products.

- **Process.** This viewpoint connotes the quality of information used in the EA processes, such as information extracted from documents and interviews.

- **Outcome.** The construct refers to the quality of information produced by a specific implementation of EA. For example, if an IS is implemented according to EA, the construct can be defined and measured as presented by DeLone and McLean [7, 8]. Similarly, the output of an implemented process producing information is evaluated correspondingly.

- **Impact.** A direct equivalent for this construct would be the quality of information related to the EA impacts, i.e. the information that describes the impacts themselves. However, such a definition complicates the model by creating an extra construct referring to EA benefits, which, according to the original definition rather follows the ideology of the Net Benefits. Hence, from this viewpoint the measures of Information Quality construct rather refer to the Net Benefits construct.

### 4.2. System Quality

The System Quality construct measures the system, i.e. IS itself [7]. It can be evaluated through functionality, flexibility, reliability, response time, integration or usability of the system [8].

- **Process.** The closest equivalent is the quality of the EA processes themselves. The process quality characteristics include effectiveness, efficiency and adaptability [27]. Also a number of process measurement methodologies have been constructed and applied.

- **Product.** From this viewpoint there is no direct equivalent apart from the EA implementation itself. EA products are typically documents, referring to the Information Quality construct. Systems are produced according to or in compliance with EA thus referring to the Use construct. Similarly, EA products are also more closely associated with the Net Benefits construct as high-quality systems can be produced according to EA, or other benefits may arise in systems development because of EA.

- **Outcome.** The construct refers to the quality of a specific EA implementation. It can be measured e.g. by the system quality criteria [e.g. 7, 8] or by the process quality criteria [e.g. 27], depending on the type of implementation.

- **Impacts.** From this viewpoint the construct refers to the quality of impacts themselves, and can thus also be conceptualized as the Net Benefits construct.

### 4.3. Service Quality

The Service Quality construct draws from the notion that IS organizations work in a dual role both as information providers and service providers [8]. This suggests that the IS organization’s service quality should also be measured with traditional measures such as Information and System Quality. In regard to the overall success of the IS organization (and not the success of a single system), DeLone and McLean [8] suggested that the service quality construct may be the most important quality component.

Work on EA produces both products and services, where the services might be crucial in facilitating the diffusion of the EA approach in the organization. Therefore, measuring merely the quality of EA artifacts is insufficient. Kluge et al. [19] suggested, opposed to the original Service Quality construct definition, that the construct could represent EA presentation strategies. That is; who is allowed to read EA content, which contents can be read, and how the content is presented. However, in our view, these dimensions are about EA artifact quality [16] being as a part of the Information Quality construct. Also the weaknesses related to the presentation strategies (e.g. the lack of understandability and the lack of timeliness) point towards information quality criteria. We argue that the Service Quality construct should be defined according to its original definition.

- **Product.** The construct represents the quality of various services (as products) provided by the EA function; that is, the stakeholders carrying out work on EA in the organization [e.g. 3, 25]. Services are typically communication-oriented requiring cooperation between the different stakeholders. Hence, measuring different characteristics of the quality of communication is emphasized [e.g. 21, 35]. These characteristics can be used to derive EA-oriented communication metrics and further, EA service quality metrics. Typical EA services include both EA reviews and EA guidance to ensure alignment of EA principles in the project and in between the projects,
4.4. Use

Originally the Use construct presented the consumption of the output of an IS by various recipients [7]. Although the IS use as a success variable has been criticized, it is still widely utilized [8]. However, “especially informed and effective use” remains an important indication of IS success although the frequency of use alone is insufficient measure. Instead, IS use should be approached and measured more extensively, including metrics related to the nature, extent, quality and appropriateness of use [8].

Kluge et al. [19] defined the EA governance strategy to be related to the Use construct. They stated that EA governance should act as an interface between various stakeholders, taking into account their specific needs. This definition does not correspond to the original definition. The more appropriate equivalents would be the use of EA products and services, and the use of EA implementations. EA governance is a part of other constructs, namely Information Quality from the viewpoint of EA products (e.g. how well the needs of various stakeholders are considered in the documentation and its representation) and Service Quality from the point of view of EA products (e.g. how well the needs of stakeholders are addressed when providing EA services).

Process. The process refers both to the quality of support services (e.g. access and availability of experts and documents), and the organizational IS services necessary for the functioning of the EA processes [c.f. 18, 35].

Outcome. The viewpoint represents the quality of services implemented according to or in compliance with EA. These services also include EA services if they are created according to or in compliance with EA.

Impact. From the EA impacts viewpoint there is no equivalent counterpart for this construct.

4.5. Intention to Use

Because the Use construct can be interpreted in various ways, e.g. as either a behavior or an attitude, DeLone and McLean [8] suggested that in some contexts, the Intention to Use construct could be used as an alternative. They acknowledged that because intention is an attitude, it is difficult to measure and even more difficult to link it with behavior (use). Hence, the Use construct might still be more feasible alternative [8]. We follow this suggestion and assume that the Use construct, with its multitude of dimensions, could be more feasible construct in most cases as intentions arise from business needs and strategies rather than from individuals and their perceptions.

4.5. User Satisfaction

In the IS domain, the User Satisfaction construct represents the user’s response to the use (or consumption) of the output of the system [7]. Both single-item and multi-item measures for the construct have been used to measure the users’ satisfaction. Hence the selection of stakeholders is emphasized [7].

Product. The construct represents the stakeholders’ response to the consumption of the output of the EA processes, i.e. to EA products and services. Satisfaction metrics could therefore measure, for example, the satisfaction towards EA products and services, or towards individual products and services.

Process. The construct can be conceptualized as stakeholder’s response to the activities in the EA processes, i.e. to what extent the actors operating in the processes are satisfied.

Outcome. The construct follows the original definition and represents stakeholders’ re-
response to the use of the output of the specific implementation of EA, e.g. an IS.

- **Impact.** With regard to EA impacts, the construct refers to the stakeholders’ response regarding the consumption of EA impacts, i.e. to what extent the stakeholders are satisfied with the realized impacts.

4.6. Net Benefits

As IS impacts range from the individual user level to the whole economy and business environment, DeLone and McLean [8] chose to keep the model simple. The Net Benefits construct correspondingly presents all kinds of IS impacts, leaving the choice of granularity to the researcher.

In the EA domain, the construct should also take into account a wide range of EA benefits on different levels of granularity. As EA encompasses the whole organization, it may consequently produce a great number of impacts which are difficult to disentangle. Because of this it has been difficult to define the benefits in concrete terms, developing metrics for them, and defining causalities between various benefits [23, 24]. Benefits achievable by EA identified in literature include, for instance, reduced costs, improved business-IT alignment, improved change and risk management, and shortened cycle times [24]. Also, when EA is implemented into an organization, it generates benefits that can be measured through its impact on business operations, e.g. bottlenecks identified from EA models. As EA consists of models for managing and developing the organization [18] the benefits above may arise from both models and their usage. This implies they may arise not only from using EA models for managing the architecture, but already from their development.

- **Process, product and outcome.** EA benefits might be realized directly from EA processes, resulting products and services, or from specific EA implementations. They can thus be conceptualized from the respective viewpoints.

- **Impact.** Indirect benefits, on the other hand, can be realized through direct ones and be conceptualized from the point of view of EA impacts, including all potential sources of impacts.

5. Illustration of the Model in a Real-Life Case

To illustrate the use of the DeLone and McLean model in the EA context, we use the case description by Andersin and Hämäläinen [1] and discuss how some of the components are concretized in a real-life case. The case is chosen because it is one of the rare documented examples. It illustrates the initialization of the EA process in a Finnish telecommunication company, aiming to identify the factors that should be taken into account in the EA process initialization phase. Because of the early stage of the EA process, we have excluded the Intention to Use construct, and the outcome and impact viewpoints from every construct.

- **Information Quality.** EA work has produced several types of documentation in the company, e.g. EA models and principles. To measure the quality of information in these documents, architectural documentation quality criteria [16] can be selected according to the needs of the organization. Obtainability, understandability, availability, and ability to inform different stakeholders about the EA approach were considered important. Because of the early state of the EA process, not all of the quality criteria were applicable, e.g. documentation was not mature enough to enable measuring all dimensions of the content quality. From the process viewpoint, the quality of information could be measured with a few selected generic quality attributes [e.g. 8], timeliness and reliability.

- **System Quality.** Because of the early stage of the EA process, the quality of the process was needed to be measured to be able to observe and guide its improvement. The process was measurable as other processes in the organization. Generic quality criteria include cycle time (e.g. the time to give architectural guidance to a project), throughput (e.g. the number of project that received architectural guidance), and costs (e.g. average cost of a certain service produced).

- **Service Quality.** The company’s EA process is connected to strategy management, investment management, and project definition and support. The EA team offered EA services to these areas. A customized SERVQUAL instrument and adapted communication audit metrics can be exploited when developing service quality metrics to the viewpoint of EA products. Again, as the stakeholders might need EA guidance, it becomes the first candidate to measure. In this respect, project managers may act as data sources. General EA-related communication is also a measurement target as it indicates whether the stakeholders are aware of the EA products and services and
whether they can utilize them. From the viewpoint of EA process, similar kind of instruments can be constructed. Feasible quality criteria includes stakeholder satisfaction toward EA guidance, EA models and principles, and the their knowledge how to obtain EA products and services in the organization.

- **Use.** Measuring EA product use indicates whether the EA approach has been adopted in the organization. EA products can be used at least in the areas that are connected to the company’s EA process. The attributes by DeLone and McLean [8] provide a starting point for developing appropriate metrics. The process viewpoint, on the other hand, is not yet important as the process is in an early stage. However, a customized “EA process description compliance maturity” instrument, similar to EA compliance metrics [c.f. 33] could be developed. Feasible quality criteria include the distribution of projects that received EA guidance, that used EA models or principles; that received EA review, or that comply/do not comply with the results of EA review.

- **User Satisfaction.** From the viewpoint of EA product, the User Satisfaction construct can be measured with a single-item metric, adapted from the IS domain. From the process point of view similar kind of measures can be developed. The metrics include, e.g. the stakeholders’ satisfaction toward EA or EA functions in general.

- **Net Benefits.** The company’s EA goals include complexity management, and increasing knowledge, flexibility and customer orientation. These goals are used as a starting point for development if e.g. the Goal Question Metric approach [4] is adopted. However, the goals need to be concretized significantly before they can be measured. One feasible alternative is to chart the concrete EA-related needs of the most important stakeholders and derive a set of benefit measures from them. Benefits could be measured from all of the viewpoints, but due to the stage of the EA process, they may remain exiguous and be thus difficult to quantify. It is also very challenging to link the benefits to a specific EA viewpoint or evidence that indirect benefits even result from EA. Also, the benefits need to be measured on a regular basis to enable later comparison, and to make it possible to draw conclusions about the EA benefits. In the initial phases of the EA process, selected metrics may not show any positive change and even if they do, conclusions should be drawn carefully since a number of other factors affect the metrics as well. Realized benefits may also need to be derived from indirect metrics. In this case, some criteria for measuring EA benefits include the number of systems (management of complexity), the number of point-to-point interfaces (management of complexity), the time to implement a new business requirement to systems/processes (increased flexibility), the number of proactive/reactive change projects (increased flexibility/knowledge), the level of stakeholder satisfaction toward EA’s or EA function’s support to decision making (increased knowledge), the number of new improvements, features, services or products (increased knowledge), customer satisfaction (increased customer orientation), and the level of customer acquisition/retention (increased customer orientation).

### 6. Discussion

As seen, the DeLone and McLean IS Success Model seems to be usable in the EA context and in the EA benefit realization process. Our adapted model tailors the original model by expanding it with the four different viewpoints. Consequently, it can be used in describing the state of the EA benefit realization process. In this manner, causalities between different constructs can be examined and different factors facilitating the benefit realization can be recognized. This helps the identification of areas of improvement in EA processes, in product and implementation quality, and in the use of EA and its implementations. This way the maximum benefits are achievable with the minimum use of resources. Table 1 summarizes the constructs and EA viewpoints.

DeLone and McLean [7, 8] emphasized the significance of the context in utilizing their model. This is especially important in the EA context, because of the organization-dependent nature of EA. The example above points out that at least following factors should be defined for guiding the development of metrics for the constructs:

- **EA components available for use.** What EA process descriptions, EA products (including services) and EA implementations are available and measurable?
- **Purposes of use.** For what purposes are the EA products and implementation used? Explicit definition of purposes is required in order to
develop metrics for the quality of these components and their use.

- **Users and their needs.** Who are the stakeholders using the EA components and what are their actual EA-related needs? The stakeholders are potential data sources, and their needs can provide clues on what could be the most important factors to be measured.

- **Benefits of use.** What benefits could potentially be achieved by the usage of the different EA components? These can be used as a starting point for measuring the overall EA benefits.

Perhaps the most important aspect to be considered when planning an EA benefit evaluation is its scope. Since our adapted model covers four EA viewpoints and would thus require an extensive measurement system, there is a definite need to delimit the benefit evaluation process by carefully considering the most relevant viewpoints and constructs for evaluation. One way to do this is to consider the level of EA maturity or the phase of the EA initiative in the organization. For instance, if the EA process is at its initialization phase, as was the case in the example above, it is not feasible to measure the constructs from the EA implementation viewpoint, simply because no implementations exist. Moreover, as EA benefits may take a long time to unfold their measurement could sometimes be postponed until a certain level of EA maturity has been achieved. Also, measuring the quality attributes of the EA processes might not always be sensible particularly when the EA maturity is low. In such a situation the product quality might be more relevant target. EA product use, on the other hand, is a construct not to be disregarded. This is because it indicates whether the products are actually utilized. It also gives an indication whether any benefits might ever be realized. However, as it is difficult to directly link realized benefits to EA, it is eventually important to measure all of the constructs to establish the causal relationships and use them as evidence of EA’s impact.

It should be noted that beside EA benefits, the adapted DeLone and McLean model includes constructs related to the quality of EA processes, products and implementations. In this sense, the adapted model also encompasses areas included in EA maturity models. Yet our model adopts a more holistic and comprehensive view of EA quality and its contribution to EA benefits. It can be used as a framework to plan EA measurement and eventually to establish the causal relationships between EA benefit metrics and factors contributing them. In contrast, maturity models only give a general idea of the overall quality of EA products and processes without strong, objective empirical evidence as proven causalities.

The original DeLone and McLean model is limited in the sense that it does not consider the quality of development processes. Our adapted model takes this into account through the process viewpoint. Although this complicates the model and makes the measurement system more complex, it provides a basis to decide the most relevant factors for any particular context at any moment of time. Another weakness in our model is that it does not consider different types of EA processes separately but treats them as one construct. This raises the question

| Table 1. The DeLone and McLean model constructs and EA viewpoints |
|----------------------|----------------------|----------------------|----------------------|
| **Process**          | **Product**          | **Outcome**          | **Impact**          |
| Information Quality  | Quality of information used in EA processes | Quality of EA artifacts | Quality of information produced by implemented EA | No direct equivalent |
| System Quality       | Quality of EA processes | No direct equivalent | Quality of implemented EA | No direct equivalent |
| Service Quality      | Quality of support services to the EA function | Quality of EA services | Quality of organizational services constructed according to EA | No direct equivalent |
| Intention to Use     | No direct equivalent | Potential alternative to the Use construct | Potential alternative to the Use construct | No direct equivalent |
| Use                  | Functioning of the processes according to specifications | Consumption of EA products by stakeholders | Consumption of the output of implemented EA by stakeholders | No direct equivalent |
| User Satisfaction    | Stakeholder’s response to the functioning of EA processes | Stakeholder’s response to the use of EA products | Stakeholder’s response to the use of implemented EA | Stakeholder’s response to the consumption of EA impacts |
| Net Benefits         | Direct benefits from EA processes | Direct benefits from EA products | Direct benefits from implemented EA | Indirect benefits |
whether the causal relationships can be identified and measured. However, the constructs we have defined provide a starting point for EA benefit evaluation, and for developing a detailed benefit evaluation model to any particular context. Yet this remains to be confirmed by further research because of the limited validation of the ideas presented. In this respect, this paper provides a conceptual basis for adapting, tailoring and validating the DeLone and McLean model for the EA benefit realization process.

7. Conclusions

This exploratory study aimed to adapt the DeLone and McLean IS Success Model [8] for describing the EA benefit realization process. Consequently, the study scrutinized the seven constructs contributing to EA benefit realization from four different viewpoints, namely process, product, outcome and impact. Ideas on describing the constructs and their related metrics in the EA context were presented. Subsequently an example of how the adapted model can be used in real organizations was described.

This study contributes primarily to the research domain by clarifying the EA benefits realization process, and the concepts of EA processes, products, outcomes and impacts, for initiating further research and discussion. This guides and structures the future research efforts, similarly to the original DeLone and McLean paper, potentially building towards cumulative tradition of EA research. Also, as the phenomenon is very complex, we have not even attempted to define a new EA success model but rely on the original DeLone and McLean version which could serve as a basis on such an endeavor. Practitioners can utilize the arguments from this paper when clarifying the use of EA concepts and when initiating discussion on EA measurement and improvement. More generally, the adaptation of DeLone and McLean model to EA context reveals and concretizes some challenges and issues that need to be considered when planning the EA assessment activities. Particularly the scope and focus need to be decided before proper evaluation is sensible and possible. Also, our analysis helps one to identify appropriate stakeholders both as data sources and as being swayed by future EA activities.

As with the original DeLone and McLean model, also our adapted model needs for further validation through empirical studies. Especially the interrelationships between the constructs should be studied to discover how each construct contributes to the realization of EA benefits in reality. Preceding this, the constructs should be examined further and feasible metrics developed. Further research efforts could also focus on prioritizing the viewpoints to be covered by a generic EA measurement system.

8. Reference


