

Defining and measuring project success

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Abstract

This paper analyses the related concepts of software project success, software project management success and software project product success and proposes a set of dimensions for defining and measuring software project success. An extension of the DeLone and Mclean (1992, p. 87) model is proposed as a base model for software project success. Even though this investigation is only a first step in defining project success, it is expected to be of interest to both Information System and Project Management researchers and practitioners.

Keywords: Software Product Success, Information System Success, Software Project Success, Software Project Management Success.

1 Introduction

This paper is part of a wider study on the early prediction of software project success (hereafter referred to as project success). The focus of this paper – and one of the fundamental research issues in the wider study – is how to define and measure project success. The importance of defining and measuring project success was identified as long ago as 1986 by the Project Management Institute (PMI). In that year they devoted their Annual Seminar and Symposium to this topic (Baccarini 1999, p. 25).

Although the causes of project success and failure have been the subject of many studies (Shenhar et al. 2002, p. 111), ‘there has been little attempt in the past to define the criteria for

success' (Wateridge 1998, p. 59). Consequently, the task of developing operational measures for software success has lagged (Jiang, Klein & Discenza 2002, p. 19). Linberg (1999) goes so far as to suggest that a new theory of project success may be necessary as project success may be too narrowly defined.

This paper proposes a more comprehensive model of project success by merging the success dimensions from the Information System and the Project Management streams. An expected benefit of the proposed model is that it will assist Information System managers and Project Managers to assess the likely success of a project early in its development. Information System managers responsible for projects and the resulting information systems are also expected to be interested in this comprehensive success model.

2 Project success components

According to Baccarini (1999, p. 25) project success consists of two separate components, namely project management success and project product success. He distinguishes between them as follows:

- **project management success** focuses on the project management process and in particular on the successful accomplishment of the project with regards to cost, time and quality. These three dimensions indicate the degree of the 'efficiency of project execution' (Pinkerton 2003, p. 337).
- **project product success** focuses on the effects of the project's end-product. Although project product success is distinguishable from project management success, the successful outcomes both of them are inseparably linked. 'If the venture is not a success, neither is the project' (Pinkerton 2003, p. 344).

Thus, following Baccarini (1999), in simplistic terms project success can be summarised as:

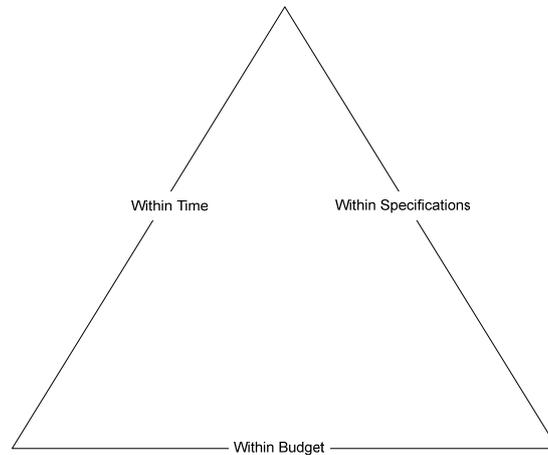
Project success = project management success + project product success

In order to develop the concept of project success, project management success and project product success will now be analysed and discussed.

2.1 Project management success

Traditionally project management success focused on the software development process dimensions of 'within time', 'within budget' and 'according to requirements' (quality and functional specifications) of a project (see figure 1).

Figure 1 Project management success – a traditional view



(Source: developed for this study)

The three dimensions of time, budget and specifications feature in many definitions of project management success (e.g. Blaney 1989; Duncan 1987; Globerson & Zwikael 2002, p. 58; Redmill 1997, p. 30; Thomsett 2003). However, time, budget and specifications are not sufficient to measure project management success as dimensions such as the quality of the project management process and the satisfaction of the project stakeholder's expectations also need to be considered (Baccarini 1999, p. 28; Schwalbe 2004, pp. 109-10). Therefore, extending the traditional triangle (figure 1) to include the quality of the management process and stakeholders satisfaction (figure 2) provides a more complete view of project management success.

Figure 2 Project management success - extended traditional view



(Source: developed for this study)

2.2 Project product success

Although outcomes of project management success and project product success are inseparable linked (Pinkerton 2003, pp. 344-5), the causal relationship between them is weak. For example by being over time and/or budget, projects can be deemed project management failures but the resulting product can be a success (Baccarini 1999, p. 29; Pinkerton 2003, p. 338). Therefore even the extended model in figure 2 is insufficient to measure project success as it omits product related dimensions such as:

- product or added value success (Baccarini 1999; Thomsett 2003); and
- user satisfaction (Jiang, Klein & Discenza 2002, p. 18).

As Pinkerton (2003, p. 338) states, ‘Using traditional criteria for evaluating project success is like using the time of a single runner to determine whether or not a relay has been successful’. There is a need to incorporate a product related dimension into the project management success model to provide a more inclusive model of project success.

The next section investigates the possibility of using the DeLone and McLean Information Success model (DeLone & McLean 1992, p. 87) to present the product success aspect of project success. Project success is discussed as:

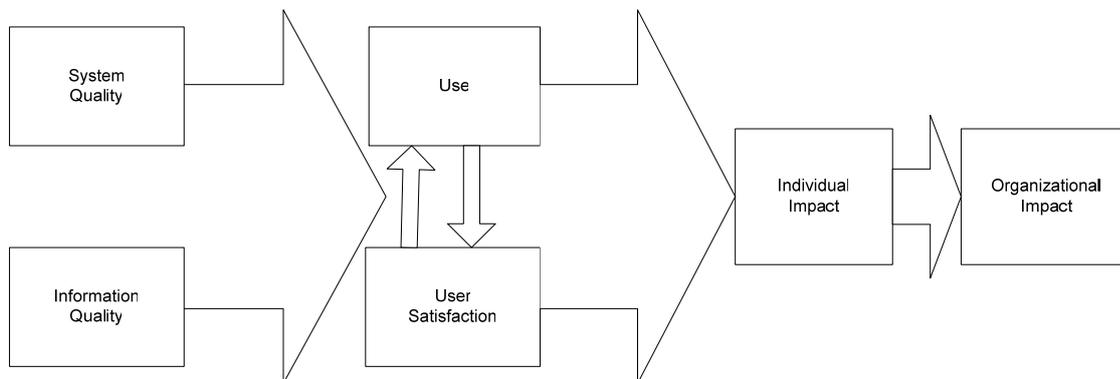
Project success = dimensions of project management success + dimensions presented in the DeLone and McLean model

3 The DeLone and McLean Information System success model

The DeLone and McLean model is an important contribution to the literature on IS success measurement as it was the first study to impose some order in IS researchers' choices of success measures (Seddon et al. 1999). The model is based on theoretical and empirical research conducted by a number of researchers in the 1970's and 1980's. To construct the model, DeLone and McLean reviewed 100 papers containing empirical IS success measures published in seven publications during 1981-1987. They distilled the resulting huge range of IS success measures into an integrated view of IS success (see figure 3), represented by the following the six dimensions:

- **System Quality:** measure of the information processing system itself
- **Information Quality:** measure of information system output
- **Information Use:** measure of recipient consumption of the output of an information system
- **User Satisfaction:** measure of recipient response to the use of the output of an information system
- **Individual Impact:** measure of the effect of information on the recipient
- **Organizational Impact:** measure of the effect of information on organizational performance.

Figure 3 The original DeLone and McLean IS Success Model



(Source: DeLone & McLean, 1992, p. 87)

The DeLone and McLean model (1992, p. 87) has four aspects which make it appropriate for incorporation into a project success model:

- **Simplicity:** the simplicity aspect of this model is achieved by the reduction of numerous success dimensions of Information Systems to only six (DeLone & McLean 1992, p. 61).
- **Acceptability:** the original DeLone and McLean model has been cited in 285 refereed papers (DeLone & McLean 2003, pp. 11-2).
- **Similarity of intention:** in the title of the DeLone and McLean (1992, p. 60) article the authors state their intention as ‘The Quest for the dependent Variable’. Project success is currently undergoing a similar quest for a dependent variable (Jiang, Klein & Discenza 2002; Linberg 1999).
- **Reusability:** various authors (Baccarini 1999; Booch 1996; Pinkerton 2003; Thomsett 2003) acknowledge that incorporating a product success component into the definition of project success is essential. To meet this acknowledged deficiency, this paper proposes the inclusion of the DeLone and McLean model as the product segment of a project success model.

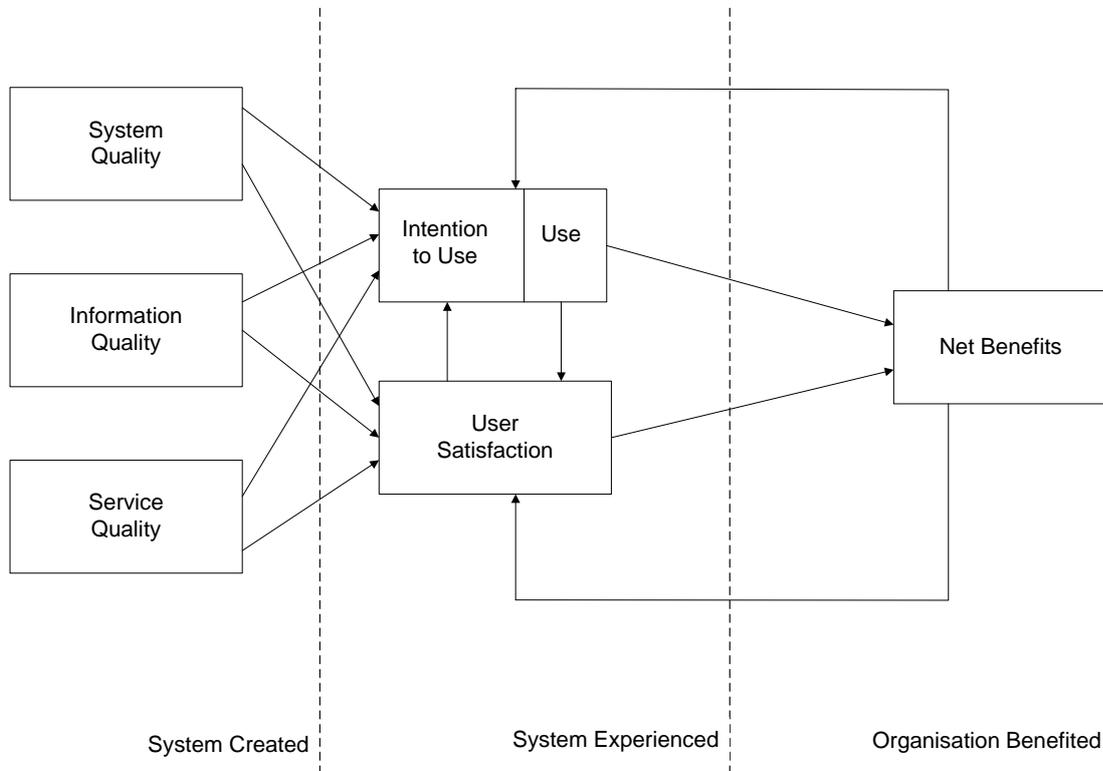
A project success model which includes the DeLone and McLean model not only inherits the four abovementioned aspects, it also allows reuse of the effort and research contributions of their model. This may be expected to accelerate the development of a dependent variable to measure software project success. For example, the measuring instruments developed for the DeLone and McLean success dimensions can be reused for the measuring of project success.

Ten years after the original model was published DeLone and McLean (2003, p. 24) published an updated model (see figure 4). The main changes in the updated model are:

- ‘Service quality’ was added as an extra dimension to ‘information quality’ and ‘system quality’.
- ‘Intention to use’ was placed alongside ‘use’.
- ‘Individual impact’ and ‘organizational impact’ were collapsed into a ‘net benefits’ dimension.
- Arrows were added to demonstrate proposed associations in a process sense (they do not express causal relationships).

An adaptation of their updated model is later incorporated into this study’s project success model (see figure 8).

Figure 4 The updated DeLone and McLean model

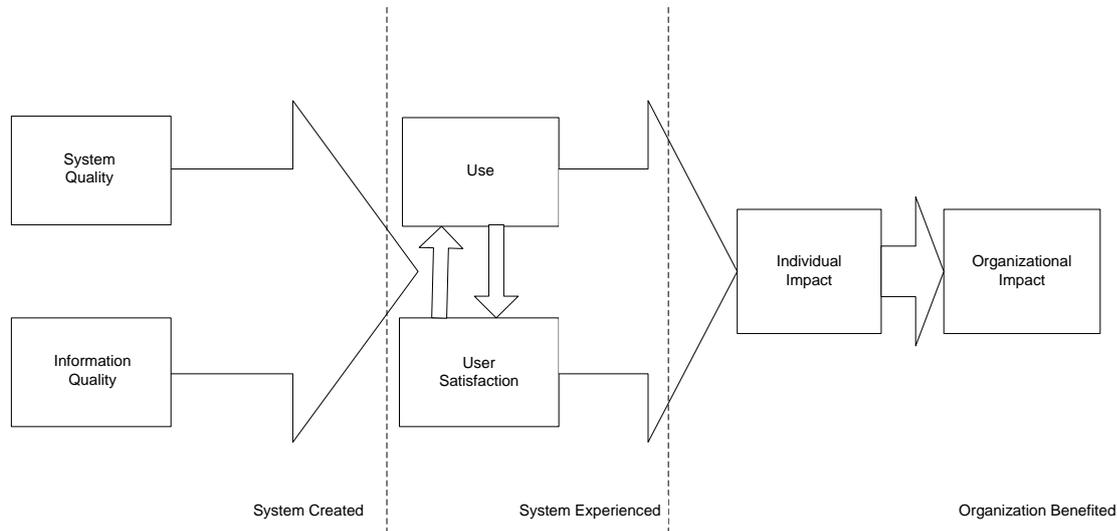


(Source: adapted from DeLone & McLean 2003, p. 24)

4 Extending the DeLone and McLean model

In a recent article DeLone and McLean (2003, p. 11) state that their original model is a temporal, process model. The temporal aspect of this model implies that a system is first *created*, then *experienced*, and lastly it has *organisational* impacts. As shown in figure 5, the *created system* contains various features and exhibits various degrees of system and information quality. Next the *experiences* of users and managers using these features are either satisfactory or not. The use of the system and its information impacts and influences collectively result in *organizational* impacts.

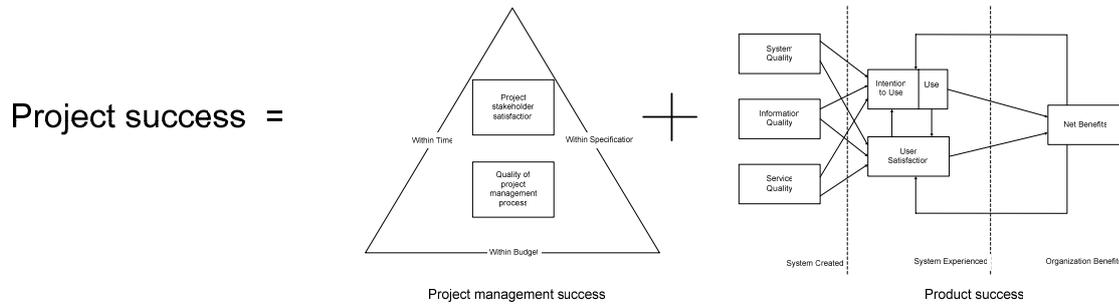
Figure 5 The DeLone and McLean's IS Success Model with the temporal aspects added to it



(Source: DeLone & McLean 2003, p. 12)

Extending the DeLone and McLean model is enabled by these temporal and process aspects of this model, as an IS product is created as a deliverable of a project management process. Therefore the project management success model (see figure 2) is added to the left side of the DeLone and McLean model in the *system created* compartment. This provides a temporal process view of the full life cycle of an Information System and this begins to present the dimensions of project success (see figure 6).

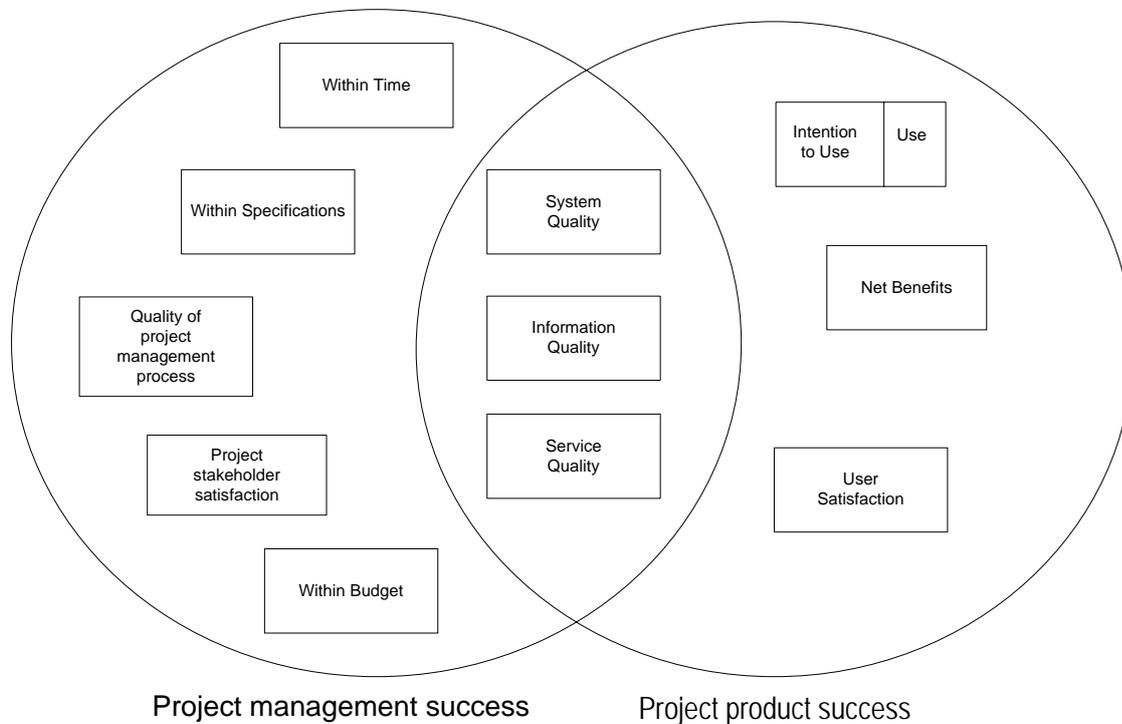
Figure 6 Adding project management success to the DeLone and McLean success model



(Source: extension of DeLone & McLean 2003, p. 24)

Overlaying the dimensions of the project management success and product success models as set elements in a Venn diagram (see figure 7) explicates their overlapping dimensions. The three IS quality dimensions in the intersection of the Venn diagram (i.e. system quality, information quality, service quality) are common to both project management success and product success. They can be seen to bridge the project management success and product success models.

Figure 7 Common dimensions in project management success and project product success.

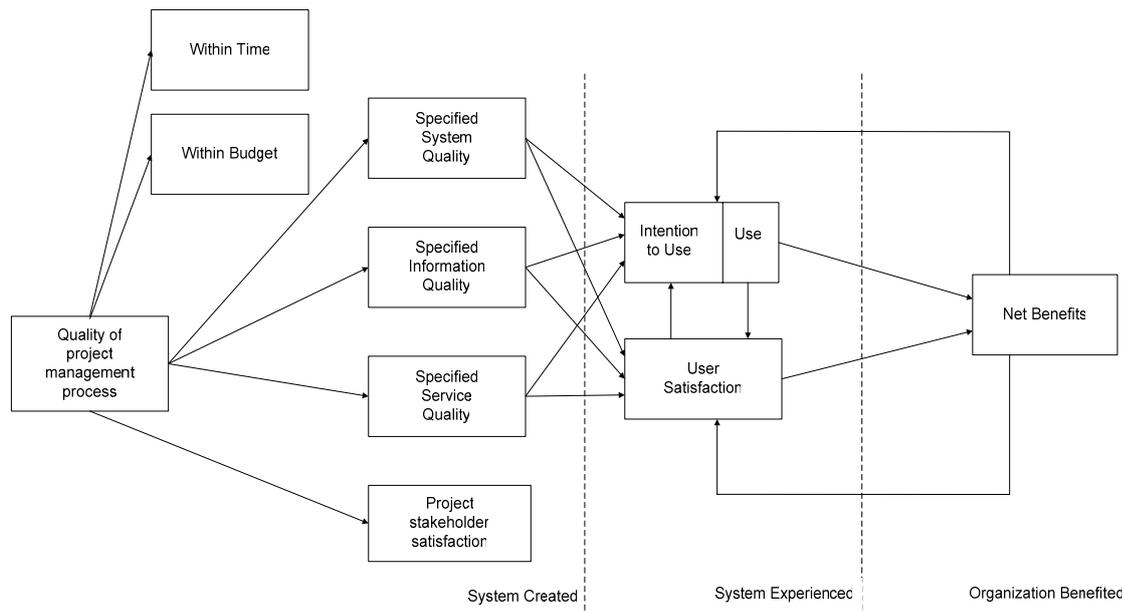


(Source: developed for this study)

The dimensions of figures 1 and 2 are now incorporated into the DeLone and McLean (2003) model. As quality implies conformance to the written specifications of a project (Schwalbe 2004, p. 264), the ‘within specifications’ dimension is represented in figure 8 by ‘specified system quality’, ‘specified information quality’ and ‘specified service quality’. The lines in the project management triangle (see figures 1 and 2) do not have the same meaning as the lines in the DeLone and McLean model therefore they are omitted.

Like figure 6, figure 8 presents project success as an extension and adaptation of the DeLone and McLean model. However figure 8 extends the DeLone and McLean model’s notations and conventions resulting in a more comprehensive model of project success.

Figure 8 A more comprehensive model of project success



Project management success

Project product success

(Source: extension of DeLone & McLean 2003, p. 24)

As depicted in table 1, the success dimensions in this model satisfy the requirements of project success definitions found in literature, thus indicating the validity of this model. In table 1 the project success dimensions of figure 8 are compared to project success definitions or discussions found in literature.

Table 1 Validating the success dimensions of figure 8 against literature

	(Baccarini 1999)	(Booch 1996, p. 22)	(Kerzner 2002, p. 6)	(Marchewka 2003, p. 30)	(Thomsett 2002, pp. 71-4)	(Wateridge 1998, p. 62)
Quality of Project management process	√		√	√		
Within time	√	√	√	√	√	√
Within budget	√	√	√	√	√	√
Specified system quality	√	√	√	√	√	√
Specified information quality	√	√	√	√	√	√
Specified service quality	√		√			√
Project stakeholder satisfaction	√		√	√	√	√
Use		√				√
User satisfaction	√	√	√	√	√	√
Net benefits	√			√	√	√

(Source: developed for this study)

5 Complexity and detail

The proposed model in figure 8 presents ten dimensions needed for measuring project success. The model does not include system types and stakeholder aspects of the project success dimensions. Extending the model to incorporate these aspects would significantly add to the complexity of the model and the resulting operational instruments. For example, relating the ten dimensions in figure 8 to the five stakeholder and six system type dimensions mentioned by Seddon et al. (1999) results in 300 combinations. Of course, adding even more aspects such as time variances in success dimensions and hierarchical ordering of success dimensions (Baccarini 1999) will result in an exponential explosion and an unmanageable measuring construct and unwieldy operational instruments.

6 Summary

This paper has incorporated the traditional definitions of project success into the DeLone and McLean model of Information System Success. This more comprehensive model incorporates both the project management success and project product success components of project success. The model provides the basis for an instrument to measure the dependent variable, project success. To contain complexity, the differences in the perceptions of stakeholders (Linberg 1999; Seddon et al. 1999) and different system types (Seddon et al. 1999) are not incorporated. The model attempts to walk the fine line between simplicity and complexity, and usefulness and comprehensiveness. Measuring software project success is not going to be easy!

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