Computing Handbook
Information Systems and Information Technology
Heikki Topi, Allen Tucker

Future of Information Systems Success: Opportunities and Challenges

Publication details
William DeLone, Ephraim McLean, Darshana Sedera
Published online on: 14 May 2014

Accessed on: 12 Nov 2018

PLEASE SCROLL DOWN FOR DOCUMENT

Full terms and conditions of use: https://www.routledgehandbooks.com/legal-notices/terms

This Document PDF may be used for research, teaching and private study purposes. Any substantial or systematic reproductions, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The publisher shall not be liable for an loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.
70.1 Introduction

Organizations continue to make substantial investments in information systems (IS), expecting positive impact on the organization and its employees. Such investments in contemporary information systems are under increasing scrutiny, and there is strong pressure to justify their value and contribution to productivity, quality, and competitiveness of organizations (Markus et al. 2003), regardless of the state of the economy (Kanaracus 2008). Even though it is difficult, research has also emphasized the importance of systematically measuring information system success. As stated by Peter Drucker (1987), "If you cannot measure it—you cannot manage it" (p. 47). With contemporary organization-wide IS, measuring success takes on special importance since the costs and risks of these large technology investments rival their potential payoffs.

In practice, however, IS investments, though often carefully rationalized in advance, are seldom systematically evaluated after their implementation (Thatcher and Oliver 2001). When post-implementation reviews do occur, their process and measures are often idiosyncratic and lacking credibility or comparability. Moreover, the impacts of information technology (IT) are often indirect and influenced by factors related to the user, organization, and environment; therefore, measurement of information systems success is both complex and illusive. In academic research, however, there is a long-standing tradition of research on system evaluation, dating to 1970s (King and Rodriguez 1978; Rolefson 1978; Matlin 1979). In 1992, DeLone and McLean published their IS success model, which is one of the most widely cited papers of IS success. Moreover, approaches like the Balanced Scorecard also have received great
Information Systems and the Domain of Business Intertwined

attention over the years. Yet, as Sabherwal et al. (2006, p. 1849) observe, “Despite considerable empirical research, results on the relationships among constructs related to information systems success, as well as the determinants of IS Success, are often inconsistent.” In order for the IS success research to be relevant to practitioners and to continue as a vibrant research stream for academia, we must continue to identify opportunities and challenges for future researchers.

The objective of this chapter is to revisit the foundations of system evaluation studies and to identify some opportunities for future studies. In order to identify the opportunities, we make specific observations on five fundamental questions of system evaluations. Taking the DeLone and McLean IS success model as a framework, this chapter will make several recommendations regarding the challenges and opportunities that we must pursue. Our recommendations herein, though based on the DeLone and McLean model, can be generalized to most IS performance measurement approaches.

The opportunities and challenges of IS success research are derived using six simple considerations. As simple as they might sound, these six considerations provide an organized way to focus on the measurement properties of information system success. Our aim in this chapter is not to criticize the DeLone and McLean model. On the contrary, our discussion herein is motivated by the opportunities that have always existed with their framework. We explore what it would take to extend their model into new directions.

70.2 Information Systems Success

Keen (1987, p. 3) described the mission of IS as “the effective design, delivery, use and impact of information technologies in organizations and society.” Based on this view of information systems, we believe the evaluation of the “effectiveness” or “success” of information systems is an important aspect of the information systems field, both in research and in practice. However, with the evolution of systems, users, and user requirements, the manner in which we evaluate the success of an information system has changed over time as the context, purpose, and impact of information systems have evolved. It is, therefore, essential to understand what these changes have been and what they mean for the future.

In general, information systems success research evaluates the effective creation, distribution, and use of information via technology. As information systems have developed since the mid-1950s, information has become more voluminous and systems have become ubiquitous and accessible by all. If we believe that information is power, this progress in information availability has changed the power relationships between corporations and consumers, between buyers and suppliers, between small business and large business, and between citizens and their governments.

However, unlike single, one-off investments, information systems are long-term investments, whose performance is subjected to a range of contextual factors. Moreover, IS, being long-term investments, are expected to yield a continuing flow of benefits into the future (Gable et al. 2008). Gable et al. (2008) defined IS success as a measure at a point in time of a stream of net benefits from the IS, to date and anticipated, as perceived by all key user groups. Further complexity arises due to changes in the user base and the access mechanisms, making infinite possibilities in terms of the purpose of an IS and the definition of its stakeholders.

Historically, researchers have employed objective, financial indicators to assess the impact of an information system (e.g., Brynjolfsson and Hitt 1996). However, as many have argued (Davenport 2000; Kaplan and Norton 2000), contemporary information systems provide financially quantifiable benefits as well as substantial nonfinancial benefits. Considering this, to measure the success of these various information systems, organizations are moving beyond traditional financial measures, such as return on investment and return on assets (Rubin 2004). For example, research suggests that large enterprise systems provide tangible as well as substantial intangible benefits to organizations, and highlight the importance of capturing these intangible benefits. In an effort to better understand such benefits of their IS, organizations have turned to methods such as the Balanced Scorecard of Kaplan and Norton (1996). Researchers, too, have developed several
methods for assessing IS success using intangible measures (DeLone and McLean 1992, 2003; Gable et al. 2008), most focusing on the subjective assessment of the system by the users of the system. Of these subjective, user-centric system evaluations, the DeLone and McLean (1992) IS success model, in particular, has been widely adopted in a number of research contexts. The DeLone and McLean IS success model has been widely adapted and tested in a number of different system types (e.g., e-commerce, knowledge management systems, ERP) and has been validated across range of geographical settings.

### 70.3 DeLone and McLean IS Success Model

This chapter will later briefly introduce the DeLone and McLean model since it is the most widely cited and used IS evaluation model in academia. As of September 2012, we found over 8000 citations in Google Scholar for their 1992 (~5000 citations) and 2003 (~3000 citations) papers. We will summarize here its evolution, strengths, potential weakness, and limitations. The DeLone and McLean model is a good example of how the IS success construct has evolved over the years.

Early attempts to define information system success were ill-defined due to the complex, interdependent, and multidimensional nature of IS success. To address this problem, DeLone and McLean (1992) performed a review of the research published during the period 1981–1987, and created a taxonomy of IS success based upon this review. In their 1992 paper, they identified six variables or components of IS success: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. However, these six variables are not independent success measures, but are interdependent variables. Figure 70.1 shows this original IS success model (DeLone and McLean 1992). Figure 70.2 shows the revised model in 2003, where the authors added service quality and consolidated organization and individual impacts to net benefits.

![Figure 70.1 DeLone and McLean (1992) IS success model.](image1)

![Figure 70.2 Revised DeLone and McLean (2003) IS success model.](image2)
As the authors explain (DeLone and McLean 2003, pp. 10–11):

The primary purpose of the 1992 article in Information Systems Research was to synthesize previous research involving MIS success into a more coherent body of knowledge and to provide guidance to future researchers. … The semantic level is the success of the information in conveying the intended meaning. The effectiveness level is the effect of the information on the receiver. In the IS Success Model, SYSTEMS QUALITY measures technical success; INFORMATION QUALITY measures semantic success; and USE, USER SATISFACTION, INDIVIDUAL IMPACTS, and ORGANIZATIONAL IMPACTS measure effectiveness success.

Based on both process and causal considerations, these six dimensions of success are proposed to be interrelated rather than independent. … A temporal, process model suggests that an information system is first created, containing various features, which can be characterized as exhibiting various degrees of system and information quality. Next, users and managers experience these features by using the system and are either satisfied or dissatisfied with the system and/or its information products. The use of the system and its information products then impacts or influences the individual user in the conduct of his or her work, and these individual impacts collectively result in organizational impacts.

The primary conclusions of DeLone and McLean’s 1992 paper (1992, pp. 87–88) were quoting the original:

- “The multidimensional and interdependent nature of IS success requires careful attention to the definition and measurement of each aspect of this dependent variable. It is important to measure the possible interactions among the success dimensions in order to isolate the effect of various independent variables with one or more of these dependent success dimensions. Selection of success dimensions and measures should be contingent on the objectives and context of the empirical investigation; but, where possible, tested and proven measures should be used.”
- “Despite the multidimensional and contingent nature of IS success, an attempt should be made to reduce significantly the number of different measures used to measure IS success so that research results can be compared and findings validated. More field-study research should investigate and incorporate organizational impact measures.”
- “This success model clearly needs further development and validation before it could serve as a basis for the selection of appropriate IS measures.”

### 70.3.1 Model Adoption

Shortly after the publication of the original DeLone and McLean success model, IS researchers began proposing modifications to this model. Accepting the authors’ call for “further development and validation,” Seddon and Kiew (1996) studied a portion of the IS success model (i.e., system quality, information quality, use, and user satisfaction). In their evaluation, they modified the construct, use, because they “conjectured that the underlying success construct that researchers have been trying to tap is Usefulness, not Use” (p. 93). Seddon and Kiew’s concept of usefulness is equivalent to the idea of perceived usefulness in technology acceptance model (TAM) by Davis (1989). They argued that for voluntary systems use is an appropriate measure; however, if system use is mandatory, usefulness is a better measure of IS success than use. DeLone and McLean (2003) responded that even in mandatory systems, there can still be considerable variability of use and therefore the variable use deserves to be retained.

Researchers’ adoption of the IS success model has been overwhelming. Many of these authors’ articles positioned the measurement and/or the development of their dependent variable(s) within the context of the DeLone and McLean IS success framework. By using the model as a common framework for reporting and comparing research work involving IS success or effectiveness, we believe one of the primary purposes of the original article has been achieved.
Although many of the cited articles tend to justify their empirical measurement of IS success by citing the DeLone and McLean IS success model, some of them fail to heed DeLone and McLean's cautions. They state “... they [researchers] used the model like a drunkard uses a lamppost—for support rather than for illumination. They overlooked the main conclusion of the article—that IS success is a multidimensional and interdependent construct—and that it is therefore necessary to study the interrelationships among, or to control for, those dimensions, ... Researchers should systematically combine individual measures from the IS success categories to create a comprehensive measurement instrument” (1992, pp. 87–88). Although many authors did not choose to measure (or control for) the various dimensions of IS success, a number of other researchers have used multidimensional measures of IS success in their empirical studies and have analyzed the interrelationships among them.

The DeLone and McLean (1992) IS success model has weathered criticism, as well as received widespread acknowledgement as one of the watershed studies in the IS discipline. Their model has been tested in full, and in some cases partially, in over 200 studies since 1992. In 2008, Petter et al. (2008) identified 180 empirical studies that had employed the DeLone and McLean success model. The model has been applied in system evaluation studies, data processing systems, e-business applications, and Enterprise Resource Planning systems. As Petter et al. (2008, p. 237) noted “... As a field, we have made substantial strides towards understanding the nature of IS success. For example, the widely cited DeLone and McLean model of IS success (1992) was updated a decade later based on a review of the empirical and conceptual literature on IS success that was published during this period (DeLone and McLean, 2003) .... [S]ome researchers have synthesized the literature by examining one or more of the relationships in the DeLone and McLean IS success model using the quantitative technique of meta-analysis (Mahmood et al. 2001; Bokhari 2005; Sabherwal et al. 2006) to develop a better understanding of success. Others have started to develop standardized measures that can be used to evaluate the various dimensions of IS success as specified by DeLone and McLean” (e.g., Sedera and Gable 2004).

### 70.4 Identifying Opportunities in IS Success

Having discussed IS success, the DeLone and McLean IS success model, and some criticisms of it, we will now address some potential opportunities and challenges for future IS success research. Our discussion here is guided by Cameron and Whetten (1983), who suggested five fundamental questions that must be considered in any evaluation. Next, we focus on the opportunities specific to the DeLone and McLean model.

As Cameron and Whetten (1983) suggest, five fundamental questions must be answered before attempting any evaluation of success:

1. WHAT SYSTEM?—On what domain of activity (what system) is the assessment focused?
2. WHO?—From whose perspective is effectiveness being assessed?
3. WHY?—What is the purpose for assessing effectiveness?
4. WHEN?—What time frame is being employed?
5. HOW?—What measures and constructs are being used?

We believe that the evaluator must address the aforementioned questions before embarking on an evaluation. The following section discusses each of those five questions in relation to information system success.

#### 70.4.1 WHAT? The “System” of Evaluation

In defining a “system,” there are two points of view to be considered: (i) the type of the system and (ii) the scope of the system. First, in every IS success study, one must specify the type of the system or application that they are evaluating and develop approaches and measures appropriate to them. Second, and in most cases concurrently, you must select the scope of the system/application.
First, studies on system typologies identify the salient differences between different types of systems. For example, McAfee (2006) identifies three types of systems: functional IT, network IT, and enterprise IT. He notes that there are substantial differences among these three in terms of their core purpose, the types of users (i.e., the potential study participants), and the system outcomes. Thus, an IS success study must derive it objectives, approach, and measures according to the types of the IS.

Second, one must establish a clear scope of the system to be evaluated. For example, a system can be defined as narrowly as a particular process, module, or function (e.g., a procurement process) or as broadly as an application portfolio. In each case, noting that neither approach is superior or inferior, the researcher must consider the implications of the scope of the system under investigation. Both system types and scope of the system provide useful boundaries for a system evaluation. Thus, akin to arguments by Burton-Jones and Straub (2006), one must select appropriate measures for the circumstances, without employing “omnibus” measures. The following section provides a summary of McAfee’s classification of systems and its implications for IS success studies. Next, we focus on the scope of the system and how it influences IS success studies.

### 70.4.1.1 Types of Information Systems

At a high level, information systems can be classified as (i) hedonic—developed for pleasure and enjoyment or (ii) utilitarian—developed to improve individual and organizational performance (van der Heijden 2000). However, hedonic applications in organizations are still not common. Thus, in this discussion, we adopt the utilitarian subclassifications of McAfee (2006). Table 70.1 provides a summary of system types, examples, and considerations for system success.

#### TABLE 70.1 System Classifications and Implications for IS Success

<table>
<thead>
<tr>
<th>Category</th>
<th>Function IT</th>
<th>Network IT</th>
<th>Enterprise IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Assists with the execution of discrete tasks</td>
<td>Facilitates interactions without specifying their parameters</td>
<td>IT that specifies business processes</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Can be adopted without complements&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Does not impose complements&lt;sup&gt;a&lt;/sup&gt;, but lets them merge over time</td>
<td>Imposes complements&lt;sup&gt;b&lt;/sup&gt; throughout the organization. Defines tasks and sequences</td>
</tr>
<tr>
<td></td>
<td>Impact increases when complements are in place</td>
<td>Does not specify tasks or sequences</td>
<td>Mandates data formats</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accepts data in many formats</td>
<td>Use is mandatory</td>
</tr>
<tr>
<td>Examples</td>
<td>Spreadsheets, computer-aided design, statistical software</td>
<td>E-mails, instant messaging, wikis, blogs, and mash-ups</td>
<td>ERP, CRM, and SCM</td>
</tr>
<tr>
<td>Automation</td>
<td>Some degree of automation (e.g., spell check)</td>
<td>Very low level of automation</td>
<td>High level of automation</td>
</tr>
<tr>
<td>Key user groups</td>
<td>More likely to have a single key user group</td>
<td>More likely to have a single key user group</td>
<td>Multiple key user group using the same system very differently</td>
</tr>
<tr>
<td>Considerations for</td>
<td>Most users would remain proficient with the basic system features</td>
<td>Limited work-oriented functionality</td>
<td>High automation of business processes</td>
</tr>
<tr>
<td>system success</td>
<td>Potential to improve performance through deeper and exploratory use</td>
<td>Access to system features is equal across all key user groups</td>
<td>Many key user groups have different types of uses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth of use would not result in substantial improvements</td>
<td>Must consider mandatory and nonmandatory uses</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>For processes with high automation, frequency of use will only provide observations of efficiency</td>
</tr>
</tbody>
</table>

<sup>a</sup> Complements are defined by McAfee (2006, p. 142) as “organizational innovations, or changes in the way companies get work done.”

<sup>b</sup> Examples of complements that allow working performing technologies, according to McAfee (2006, p. 143) are “better-skilled workers,” “higher levels of teamwork,” “redesigned processes,” and “new decision rights.”
The characteristics of each system type are explained in Table 70.1. We acknowledge there are other classifications of system types, but we chose McAfee’s classification for its simplicity, yet for its discussion of key user groups and system complexity for success measure specifications.

McAfee’s (2006) classification of systems highlights the danger in using all-purpose, omnibus constructs and measures for IS success evaluations. The characteristics of the three types of systems show that each system is designed to provide specific, almost nonoverlapping service to a specified group of key users.

### 70.4.1.2 Scope of the System under Investigation

The second consideration relates to scope of the system. This is more complex than system classifications and can yield multiple overlapping interpretations. With the ever-expanding boundaries of systems, information systems are no longer restricted to “back-office” applications. More and more organizations now use organizational-wide systems (like ERPs), some consumed through web portals, hosted in the “cloud,” and managed by third-party service providers.

Thus, defining the “scope” of a system is an important consideration in IS evaluation. The focus will depend on the areas that are generally defined as “the system.” For example, Seddon et al. (1999, p. 6) identified six levels of scope that should be evaluated:

1. An aspect of IT use (e.g., a single algorithm or form of user interface)
2. A single IT application (e.g., a spreadsheet, a PC, or a library cataloging system)
3. A type of IT or IT application (e.g., TCP/IP, a GDSS, a TPS, a data warehouse, etc.)
4. All IT applications used by an organization or sub-organization
5. An aspect of a system development methodology
6. The IT function of an organization or sub-organization

As suggested in Seddon et al. (1999), isolating “the system” for evaluation is difficult, but must be done for evaluations to be meaningful. Even after scoping the boundaries of the system being considered for evaluation, certain aspects would still need to be resolved in the minds of both the evaluators and the researchers. They include other systems or portfolio of systems, the infrastructure, the IT function or the IT support service quality, and the administrative area with which the system is most closely associated.

A key challenge for the researcher here is to gain an understanding of the system of interest, without being influenced by aspects that may be a part of the system, but not be a part of the system of interest. As noted in several recent studies (DeLone and McLean 2003; Gable et al. 2008; Petter et al. 2008), most past studies reuse measures and constructs without much considerations as to the type and scope of the system(s). Therefore, this presents a clear opportunity for IS researchers to identify ways to determine the scope of a system. For example, a generalizable taxonomy to identify the system of interest may provide much value for the cumulative tradition of IS success research. The relationship between scope of IS and the type of IS is depicted in Figure 70.3.

Some considerations for developing such a taxonomy are stated here. First, the perceptions of the quality of the system may be influenced by perceptions of the infrastructure; a system may be perceived as slow, because the associated infrastructure is inadequate or underpowered. However, in such circumstances evaluators may not be knowledgeable or aware of the circumstances beyond their immediate work systems, and would not recognize the issues attributable to the IT infrastructure rather than to the system of interest. Second, the scope of the system being evaluated can be defined more narrowly or more broadly, depending on the nature of the evaluation being undertaken. This would make it impossible to compare and benchmark across systems. Third, increasingly when systems services are delivered using web portals, researchers would find it difficult to identify “the system.” Similarly, end users will find it even more difficult to identify which system they are accessing and how they will receive information from it. If the researcher evaluates the goodness of the web portal at a high level, such information would not be adequate to address the management and performance issues of the underlying system.
The stakeholder is the one who interacts with the system and consumes the information generated by the system. Stockdale and Standing (2006) argue that “… the evaluators must decide which groups are relevant to the project being evaluated. The power associated with stakeholder groups and its implications for effective evaluation is a complex issue that the evaluators should be aware of since there is a danger that outcomes may be skewed to meet the objectives of those holding power” (p. 1093). Stockdale and Standing (2006) identify four types of stakeholder groups relevant for a system evaluation:

1. Initiators of the evaluation
2. The evaluators who conduct the evaluation
3. The users of the systems being evaluated
4. A range of other parties such as trade unions and government agencies

In relation to the Stockdale and Standing (2006) stakeholders, most of the IS success studies have included the users of a system. Seddon et al. (1999, p. 167) also introduced a classification of stakeholders and found that the evaluation of IS effectiveness was generally based on the perceptions of one or more of the following five types of stakeholders:

1. An independent observer, who has no personal stake in the measure
2. An individual user, who evaluates a system from his or her own point of view
3. A group of users, e.g., a group decision support system (GDSS)
4. The management or owners of the organization
5. A country or all of mankind

Here too, many of the IS success studies appear to have concentrated on the post-implementation evaluation of system success, employing the perceptions of the end users. With the transition from in-house, custom-made, stand-alone legacy IS applications to integrated, customizable, and packaged applications, organizations are looking to engage multiple user groups with a single application. For example, Grover et al. (1996) state that there are four key user groups that could take part in a contemporary IS success data collection. The four groups are operational, management, strategic, and technical staff. Similar views have been reported by other researchers as well (Kang and Santhanam 2003;
Grabski et al. 2011). For example, in enterprise systems (e.g., SAP), the operational staff would use an ES for routine business transactions on a daily basis, while middle management would periodically engage the same system for management decision making. This ability to serve multiple key user groups with a single system has provided organizations with great potential in the standardization of information, process automation, and improvements of transparency (Morris and Venkatesh 2010; Seddon et al. 2010; Strong and Volkoff 2010).

How do the multiple stakeholders of a system impact information system success? First, different stakeholders may have different opinions regarding the performance of the same system. As Gable et al. (2008) have demonstrated, different stakeholder groups will have different views of the DeLone and McLean success dimensions. Gable et al. (2008) observed that operational staff tend to place a higher emphasis on system quality when they evaluate information system success, while senior executives (e.g., strategic-level staff) place a higher emphasis on organizational benefits. Second, Gable et al. (2008) stressed the importance of canvassing all stakeholders of a system. They argue that unless all users are canvassed for their views of a system the evaluation will only be partial.

The differences in perspectives across information system stakeholders have been long established in the information system success literature (Cameron and Whetten 1983; DeLone and McLean 1992; Seddon et al. 1999). However, information system research is yet to fully appreciate the impacts of using a single system by multiple user groups. For instance, these different user groups often have multiple and often conflicting objectives and priorities (Gable et al. 2008; Strong and Volkoff 2010). For instance, one user group could have one experience in their interactions with a system, as compared to the interactions of another user group using the same system (Park et al. 2007). Although an enterprise system may be viewed as a success from the standpoint of one user group, it may be interpreted as unsuccessful by another (Urbach et al. 2009).

Robert Anthony (1965) provides a useful classification scheme of management-level activities: strategic, managerial, and operational. The different levels presented by Anthony are important in IS evaluation studies. According to Anthony, the strategic level focuses on organization-wide objectives and allocates the necessary resources to achieve these objectives. The strategic level is involved in complex, irregular decision making, focusing on providing policies to govern the entire organization. At the strategic level, information requirements are ad hoc in nature, with information relevant for long-term organizational planning. At the managerial level, the information requirements are focused on ensuring that the resources, both human and financial, are used effectively and efficiently to accomplish the goals stated at the strategic level. The characteristics of the information required at the managerial level are different from those that are required at the strategic level. The managerial level deals with integrated and procedural information that is necessary for a precise task. Therefore, managers at this level tend to prefer “goal congruent” information systems. At the operational level, employees are involved in highly structured and specific tasks that are structured, routine, and transactional. Tasks carried out at the operational level are precise and are governed by organizational rules and procedures. Operational employees deal with real-time data focused on individual events with little or no emphasis on key organizational performance indicators. The three levels of management described by Anthony tend to be hierarchical on several dimensions: (1) the time horizon of decisions (i.e., long, medium, and short term), (2) the importance of a single action (i.e., critical, important, and routine), and (3) the level of judgment (i.e., strong, moderate, and modest). Using Anthony’s framework, Table 70.2 demonstrates possible differences in opinions of the three management levels in relation to enterprise system and information requirements.

Alloway and Quillard (1983) emphasize the importance of operational personnel using a system appropriately in order for the senior managers to be able to make effective use of the system, since the aggregated information at the managerial level depends on the transactions at the operational level. Furthermore, it is argued that enterprise systems, in particular, often fail at the operational and transactional levels because operational users take shortcuts to circumvent the restrictive standards of the enterprise system (Mabert et al. 2001; Umble et al. 2002; Sedera et al. 2003).
We identify several challenges and opportunities for future studies on the perspective of evaluation. These challenges are ever more important, given the paradigm shift of developing systems for a number of user groups, instead of developing specialized systems for single user groups. First, researchers should identify the interested user groups prior to conducting their empirical assessments. As shown in Table 70.2 and the related discussion, it is evident that each user group has distinct needs that are quite different from one another. Thus, your data collection instruments (e.g., questions or survey items) must be developed with attention to the characteristics of the different user groups. Gable et al. (2008) suggest that certain user groups will be closely aligned with certain success dimensions. They argued, for example, that operational personnel will place a greater emphasis on certain success dimensions to the exclusion of others when they evaluated a system.

Second, there is a real challenge for researchers to identify the relevant respondent characteristics, other than those that relate to their general employment classifications. For example, factors like respondents’ exposure with similar systems, their knowledge of the system in question, and their experience with similar industry sectors will all have an impact on how they evaluate a system.

Alternative classifications of user groups are another opportunity for the future research. For example, Sedera and Dey (2008) suggest an alternative classification of respondents based on their skills and degrees of proficiency. They devised a survey instrument—based on knowledge, socio-behavioral factors, and experience—to classify respondents based on degree of proficiency. Their study also suggested that groups with different degrees of proficiency will have different opinions of system success.

Another opportunity comes with the weighted average score of the respondent’s views of the system. All past subjective system evaluation studies have treated scores of all respondents equally. This has meant that, regardless of the characteristics of the respondent, all respondents have an equal say of the system evaluation. From a management viewpoint, this is problematic and less valuable. A weighted-average scale would assign weights based on respondent characteristics and the dimensions of success on which they evaluate. When a group of respondents indicate a greater association, and familiarity, with a particular dimension of success, their scores on that dimension could receive a high weighting than the others (Gable et al. 2008).

### Table 70.2 Key-User-Group Characteristics

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Strategic</th>
<th>Managerial</th>
<th>Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>System use</td>
<td>Less direct access</td>
<td>Sporadic, ad hoc</td>
<td>Daily, routine access</td>
</tr>
<tr>
<td>Use of system features</td>
<td>Rare use of high-level reports</td>
<td>Aggregated, summative</td>
<td>Sporadic, ad hoc</td>
</tr>
<tr>
<td>Level of interaction</td>
<td>Generally minimal</td>
<td>Moderate</td>
<td>Frequent</td>
</tr>
<tr>
<td>Knowledge of the system</td>
<td>Generally minimal</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Flexibility of the system</td>
<td>Requires much flexibility</td>
<td>Moderately flexible</td>
<td>Structured, less flexibility</td>
</tr>
<tr>
<td>Information focus</td>
<td>Futuristic, one aspect at a time</td>
<td>Whole organization</td>
<td>Single task/transaction</td>
</tr>
<tr>
<td>Information complexity</td>
<td>Many variables</td>
<td>Less complex</td>
<td>Simple, rule-based</td>
</tr>
<tr>
<td>Information structure</td>
<td>Unstructured, irregular</td>
<td>Rhythmic, procedural</td>
<td>Highly structured</td>
</tr>
<tr>
<td>Nature of information</td>
<td>Tailor made, more external, and predictive</td>
<td>Integrated, internal but holistic</td>
<td>Task specific, real time</td>
</tr>
<tr>
<td>Information scope</td>
<td>Long term</td>
<td>Long, medium, and short</td>
<td>Short term</td>
</tr>
</tbody>
</table>

© 2014 by Taylor & Francis Group, LLC
Finally, we observe that there is potential for “collective” and “group-level” success studies. It has been widely accepted that system success in organization-wide systems depends heavily on the cooperative work of stakeholders, within and across the stakeholder groups. Thus, in addition to addressing success as an individual construct, there is potential to address it as a group-level, collective construct. As such, the questions will focus on “Has the IS helped improve the collective performance,” rather than its success at the individual level.

**70.4.3 WHY? The Purpose of the Evaluation**

Gable et al. (2008) observed that organizations evaluate their information system (IS) for various reasons. A frequently asked question is “Has the IS benefited the organization?” or “Has the IS had a positive impact?” Positive impacts are the ultimate outcome measure of an IS; the “acid test” of the IS. These questions seek a measure of the net benefits or impacts to date; they look backward. The IS, being a long-term investment, is expected, other things being equal, to yield a continuing flow of benefits into the future. Thus other questions of interest include “Is the IS worth keeping?” “Does the IS need changing?” or “What future impacts will the IS deliver?” These questions are forward looking.

Serafeimidis and Smithson (2000, p. 97) reviewed the literature on IS evaluation and found that evaluations are done for a variety of reasons, including (1) “Establishing by quantitative and/or qualitative means the worth of IT to the organization and its growth,” (2) “Ranking alternatives,” (3) “Forming a central part of an incremental planning and control (diagnosis) process,” (4) “Acting as an input to business and IS strategy formulation,” (5) “Acting as a feedback function which assists organizational learning,” (6) “Acting as a mechanism for gaining commitment and, in highly politically influenced environments, for legitimization,” and (7) “Providing a deeper understanding of the interaction between the technology and the underlying organizational processes, culture and politics.”

Davern and Kauffman (2000) emphasized the importance of understanding where the future potential value for an IT investment lies, in both project selection evaluation and post-investment evaluation. While evaluation usually has a positive role to play, evaluation can also be for political or social reasons (e.g., to reinforce an existing organizational structure) and be a ritualistic rather than effective process (Stockdale and Standing, 2006, p. 1093). Table 70.3 lists some of the reasons why organizations evaluate IS.

Similar to the scope of the system and stakeholders’ opinion sought in an evaluation, the motivation of the assessment (the “why?”) is an important aspect of a system evaluation. Yet, there is a severe dearth of studies where the purpose of the evaluation is linked to the measures employed for the evaluation. For example, the balanced scorecard approach supports this concept; in it, the measures employed in the assessment are derived from the strategy, vision, and mission of the organization.

<table>
<thead>
<tr>
<th>Table 70.3 “Why” of Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Value Reasons</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Appraisal of value</td>
</tr>
<tr>
<td>Measure of success</td>
</tr>
<tr>
<td>Recognition of benefits</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

As noted earlier, most IS success studies focus mainly on academic contributions, focusing heavily on construct validity and reliability. Thus, such studies rely heavily on constructs and measures that had been validated in prior studies in order to minimize the risk of introducing new measures that do not have a validated "lineage." This myopic focus on construct validation often means that the context of the study is ignored. A challenge—and an opportunity—for future IS success studies is to connect the purpose of the evaluation with the measures and constructs. This means that researchers could introduce new measures and constructs based on the purpose of the evaluation. Furthermore, future IS success studies have the potential to focus more on specific, diagnostic evaluations of an IS. This also means that researchers should be much closer to the study context, management, and user issues.

### 70.4.4 WHEN? The Timing of an Evaluation

The timing of a system evaluation could easily influence the evaluation outcomes. There seems to be a lag in the effects of IS investments; thus, it is important to consider when the evaluation is being done. For example, Hitt et al. (2002, p. 72) report that for enterprise systems there is "a slowdown in business performance and productivity shortly after the implementation." Markus et al. (2003) suggest there are two phases in an enterprise-system life cycle beyond the go-live date: (1) shakedown and (2) onward/upward. The period immediately after the go-live phase is the **shakedown** phase, during which users learn new system features and functions and adjust their work practices. The **onward/upward** phase follows the shakedown phase and reflects the finished, stable system. Organizations in this phase should see high user acceptance of the system and fewer ongoing technical issues. Also, from here on in, the organizations are also looking to derive additional value from their enterprise system investment through enhancements and value-adding functions. Markus and Tanis (2000) argue that the user experience and system success will be substantially different across these two life cycle phases. Ross and Vitale's (2000) study of 15 organizations found that all organizations underwent a "productivity dip" (p. 237) at the shakedown phase, while gaining productivity improvements in the onward/upward phase.

Researchers attribute the decline in productivity with a system to factors arising from users' lack of familiarity with the new system (Sumner 2000; Strong and Volkoff 2010). Several researchers have demonstrated that users, especially operational personnel, face a steep learning curve in the shakedown phase and it will take several years to master complex software features and functions (Mandal and Gunasekaran 2003; Botta-Genoulaz and Millet 2005). Therefore, during the shakedown phase, most installations restrict access to the system and operations by enabling only mandatory functions to be accessible (Kumar et al. 2003; Amoako-Gyampah and Salam 2004) until users develop a sufficient level of proficiency. On the other hand, users in the onward/upward phase receive more liberal access to value-adding system features and functions (Botta-Genoulaz and Millet 2005) through experience and practice. Social science researchers have identified years of experience, structure of the task, and "deliberate practice" as having a substantial influence on individual performance (Chi et al. 1988; Ericsson and Smith 1991). For example, Ericsson et al. (1993) demonstrate that an individual's performance is a monotonic function of the "deliberate practice" with the system.

Segars and Grover (1993) examined IT impact at an industry level. They found that "in each of the three industries examined no immediate impact was detected. Structural shifts were observed four to five years after the introduction of the technology" (p. 362). In relation to the timing and evaluation, we identify two main streams of opportunities for future researchers: researchers must (1) focus on the longitudinal evaluation of system success and (2) identify benefits in relation to the phases of the life cycle.

First, in relation to conducting longitudinal studies, we note that most IS success studies take a snapshot of the system performance at a point in time, typically using a survey instrument. Given the long-term view of IS in organizations, longitudinal studies will allow organizations to track IS performance over time. For example, despite research suggesting a dip in organizational performance following the go-live date, current research has yet to empirically test and demonstrate the changes to performance across the life cycle. Organizations often postpone an upgrade of aging applications, seeking
to delay the relatively more tangible short-term costs. Yet, research by Gable et al. (2003) suggests that it is often optimal to upgrade an aged software earlier rather than later. A validated normative model (e.g., Figure 70.4) would aid organizations to better manage expectations of contemporary IS and to better plan mid- and longer term for evolution of the IS portfolio. This analysis essentially combines the measure(s) of IS success, positioning each application studied on the horizontal axis (the life cycle phase). Sensitivity analysis can then be conducted, through segmenting the overall study data into increasingly homogeneous segments.

Second, studies must continue to observe how benefits occur throughout the systems life cycle. Wang and Sedera (2011) conducted one of few studies that developed a benefits realization life cycle to demonstrate how IS success is achieved throughout the life cycle. Their study employed the DeLone and McLean constructs to illustrate how supply chain management system benefits appeared in a longitudinal study, proposing a benefits life cycle. For example, many studies have shown that the organizational benefits of an information system will take time to appear, while the benefits from improved system and information qualities will appear earlier in the life cycle. However, it is unreasonable to assume that all of the measures of systems quality are realized at the early phase of the life cycle. Similarly, it cannot be assumed that all of the organizational-level benefits are only realized at the latter phase of the life cycle. Therefore, future IS success studies have a real opportunity and a responsibility to contribute to a better understanding of the timing of benefits. Empirical studies depicting a specific timeline for benefits realization using the phases of the life cycle are rare.

70.4.5 HOW? The Constructs and Measures of Success

The value of IT has been measured at various levels of analysis including the economy, industry, firm, business unit, business process, and individual (Barua and Kriebel 1991; Brynjolfsson and Yang 1996; Davern and Kauffman 2000). In the early days of information system, system performance was measured in terms of technical quality using observed speed and accuracy. When information systems evolved to be strategic, researchers looked to see the impact of a system to the organization. Dedrick et al. (2003) note: “For many years, there has been considerable debate about whether the IT revolution was paying off in higher productivity. Several studies in the 1980s found no connection between IT investment and productivity in the U.S. economy, a situation referred to as the productivity paradox. Since then, a decade of studies at the firm and country levels has consistently shown that the impact of IT investment on labor productivity and economic growth is significant and positive” (p. 1). Several researchers have studied productivity improvements through productivity, profitability, and customer surplus (Hitt and Brynjolfsson 1996).
At the industry level, Segars and Grover (1995) have shown how IT has evolved from part of the organizational overhead into a strategic resource capable of changing patterns of competition within industries. They examined the nature and change of structure in three industries during, and after, the introduction of strategic IT. Their findings suggest that in each of these industries, structural characteristics were dramatically altered subsequent to the introduction of competitive-based IT. Brown (2005, p. 169) found that “reported IS evaluation practice appears to be relatively unsophisticated or absent in many organizations.” Barua et al. (1995, p. 21) demonstrated that “many of the significant IT impacts occur at low levels in the organization and they can be traced and measured.”

Hamilton and Chervany (1981) discussed two different ways in which the success of information systems could be determined by organizations. One approach to evaluating IS success was a goal-centered approach in which the information system was examined to see if the system met the objectives specified by management. The second approach was a system-resource approach that considered the users and whether the system was serving their needs to facilitate communication, improve job satisfaction, or fulfill other needs beyond the primary organizational objectives. This approach highlighted the importance of evaluating information systems from a variety of perspectives including management, users, IS staff, and internal auditors (Hamilton and Chervany 1981).

Subscribing to the second approach, to measure the success of these various IS, organizations are moving beyond traditional financial measures, such as return on investment (Rubin 2004). In an effort to better understand the tangible and intangible benefits of their IS, organizations have turned to methods such as the balanced scorecard (Kaplan and Norton 1996) and benchmarking (Shang and Seddon 2002). Researchers have created models for success (DeLone and McLean 1992; Ballantine et al. 1996; Seddon 1997), emphasizing the need for better and more consistent success metrics.

In this stream of research, researchers have derived a number of models to explain what makes some IS “successful.” Davis’s (1989) TAM used the Theory of Reasoned Action and Theory of Planned Behavior (Ajzen and Fishbein 1975) to explain why some IS are more readily accepted by users than others. Acceptance, however, is not equivalent to success, although acceptance of an information system is a necessary precondition to success. Early attempts to define information system success were ill-defined due to the complex, interdependent, and multidimensional nature of IS success. The DeLone and McLean IS success model provides researchers and practitioners a model and an approach that focuses on such fundamentals. The remaining part of this chapter outlines future research opportunities based on the DeLone and McLean IS success approach and its applications.

### 70.4.6 Future Research Opportunities

There exist several opportunities for research in relation to the conception of the DeLone and Mclean IS success model. They include (1) providing a clearer view of the nature of the paths between the key constructs; (2) extending the validity and generalizability of the model constructs and measures; (3) providing a theoretical underpinning of the study model; and (4) improving model constructs.

#### 70.4.6.1 Nature of the Paths between the Key Variables

There has been some criticism of the DeLone and McLean (1992) model for a lack of clarity about the relationships of the constructs—are the relationships among the constructs causal or process? In their 10 year update, DeLone and McLean (2003) responded that their model is both causal/variance and process. They argued that “A temporal, process model suggests that an IS is first created, containing various features, which can be characterized as exhibiting various degrees of system and information quality” (p. 11). Arguing that their model also shows variance/causal relationships, they state that “A causal or variance model studies the covariance of the success dimensions to determine if there exists a causal relationship among them. For example, higher system quality is expected to lead to higher user satisfaction and use” (p. 11). Yet, many users of the DeLone and McLean IS success model employ these constructs blindly, without any regard to the nature of the relationships among the variables.
This suggests that there are several opportunities for future research to extend our understanding of information system success as well as of the model itself. To begin, as demonstrated by Petter et al. (2008) in their meta-analysis of DeLone and McLean studies, no single study has ever addressed the complete DeLone and McLean model. Granted, this would be a rather large undertaking, and perhaps could be addressed in a series of related studies. Second, the nature of the relationship among the constructs provides an opportunity for future research on system success. For example, the necessary and sufficient causality of the model constructs is unclear in the DeLone and McLean model. According to Gable et al. (2008), the directions of the arrows between the constructs are unclear; therefore, one cannot be certain about the positive and negative relationships between the constructs.

70.4.6.2 Extending the Validity

Despite years of research on information systems success, including several hundred publications, there is still no single research study that has tested all the constructs and paths in the DeLone and McLean IS success model. Petter et al. (2008) state that “Most past studies focused on a single dimension of success, such as system quality, benefits or user satisfaction. Few studies measure and account for the multiple dimensions of success and the interrelationships among these dimensions.” They further state “Until IS empirical studies consistently apply a validated, multidimensional success measure, the IS field will be plagued with inconsistent results and inability to generalize its findings.” Gable et al. (2008) make this same observation, encouraging future research to engage in a more holistic approach in employing model constructs.

70.4.6.3 Theoretical Basis

Further opportunities exist in clarifying the relationships between the model constructs. For example, the causal relationship suggested in the model between constructs like system quality and benefits (or individual and organization benefits) requires a theoretical explanation. Moreover, the model does not provide a theoretical explanation for the time lags between constructs. These provide researchers with an opportunity to contribute to a further understanding of IS success.

70.4.6.4 Improving Construct Measurement

In addition to opportunities for improvements in the measurement of IS success variables, several conceptual improvements can also be made. First, researchers should minimize the issues surrounding the use of surrogate, self-reported measures and seek for objective measures to supplement or replace perceptual measures. There is a clear dearth of research in this area, with no studies found that employ objective measures to triangulate subjective measures. Furthermore, paying attention to model constructs that have not been well explored in past studies is another area for future research. Petter et al. (2008) identify use as one of the most under-studied constructs of IS success. Their meta-analysis identified that the relationship between each dimension and use is lower than associations with any other construct. They attribute this inconsistency of attention to the measurement and understanding of the use construct and argue that system use is an important indicator of system success.

70.5 Conclusion

In this chapter, we proposed several opportunities and challenges for IS success researchers. We began by introducing the DeLone and McLean IS success model as a point of reference. The DeLone and McLean model is one of the most widely cited academic studies in the IS domain. However, in spite of the success of the DeLone and McLean model and over three decades of active research on IS success, there are still many opportunities and challenges to the better understanding of information systems success. The body of knowledge for measuring IS success or performance in empirical studies has seen little progress during the past decade.
We presented our arguments for improvements using six considerations, describing each consideration, and followed by ways in which to move forward. We demonstrated that most IS success studies, with few exceptions, do not clarify the positioning of the study, thereby making it difficult to interpret them and use these evaluations for management purposes. First, we highlighted the implications of the evolution of the system. This is a major implication that must be taken into account for IS success studies. More and more corporate-wide systems are accessed through web portals or mobile devices, blurring the boundaries of traditional systems. We then presented several opportunities and challenges for IS researchers within this context. Next, we discussed the stakeholder views, the purpose of the evaluation, timing of the evaluation, and the measurement of success. Finally, we suggested research opportunities in relation to the reconceptualization and expansion of the DeLone and McLean success model.

References


© 2014 by Taylor & Francis Group, LLC


