TOWARDS MEASURING THE IMPACT OF MANAGEMENT SUPPORT SYSTEMS ON CONTEMPORARY MANAGEMENT

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ABSTRACT

This paper conducts a qualitative inquiry into the efforts made in evaluating the impact that management support systems (MSSs) have had on contemporary management, and the related theory employed in conducting such evaluations. The paper pursues this dual objective through an extensive literature review. The paper identifies criteria used to assess the success of MSSs, and the impact of such systems based on those criteria. The existing literature provides encouraging accounts of successful implementations of MSS projects. However, the absence of a widely accepted theoretical model for more accurately evaluating this success is somewhat glaring. Consequently, the paper proposes a generic MSS evaluation framework for subsequent testing, refinement, and usage.

The paper advances through five sections: overview of the MSSs landscape (section 1); summary of seminal works in various categories of MSSs (section 2); critical analysis of existing literature on MSSs (section 3); observations and proposal of a generic MSS Evaluation Framework that may be customized for MSS projects (section 4); summary and some concluding remarks (section 5).

Keywords
Management Support Systems; Software Evaluation; Critical Success Factors; Quality Factors; Success Indicators

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1. OVERVIEW

Management support systems (MSSs) refer to a family of software systems that are geared towards the promotion and facilitation of efficient and effective management and decision-making in the organization. Included among MSSs are the following categories: strategic information system (SISs), decision support system (DSSs), executive information system (EISs), expert system (ESs), knowledge management system (KMSs), business intelligence system (BISs), and enterprise resource planning system (ERPSs). The last three additions to this family are BIS, ERPS, and KMS. The existing literature on MSSs shows that while there is widespread agreement on the value and importance of such systems, there is no agreement on how to accurately measure their impact. This paper examines the impact of these MSSs on contemporary management. The information gathering implement is a comprehensive literature review and analysis, followed by recommendations. In exploring this topic, the following subservient questions are addressed:

a. What are the critical success factors (CSFs) and/or criteria that are typically used to assess the success of MSSs?
b. What are the quality factors that impact the success of MSS projects?
c. How successful have these systems been in meeting their objectives?
d. What lessons can be learned and what recommendations can be made towards measuring the impact of MSSs in a more deterministic way for the foreseeable future?

The paper then uses the insight gained from addressing these questions to propose an MSS evaluation framework that may be subsequently used for implementing and/or assessing the impact of such systems.

The term *business intelligence* (BI) owes its origin to Hans Peter Luhn in 1958. In 1989, Gartner analyst Howard Dresner reintroduced the term as part of an initiative to inspire innovative software and technology solutions that are more facilitating of management decision making (Power, 2007). In 1990, the Gartner Group introduced another term, *enterprise resource planning* (ERP), as a new wave of software systems geared towards strategic management of the organization (Gartner Group, 1990; Wikipedia, 2013). Meanwhile, both BIS and ERPS owe their genesis to the concept of *strategic information system* (SIS), which was first introduced by Charles Wiseman (1985), and *decision support system* (DSS), which was first introduced by Peter Keen (Keen and Morton, 1978). By the early 1990s DSSs were marketed alongside *executive information systems* (EISs) as complementary solutions. A few years earlier, John Henderson and his colleagues had introduced the term *management support system* (MSS) to include *management information system* (MIS), EIS, and DSS (Henderson, Rockart, and Sifonis, 1987). The latest addition to the MSS family is *knowledge management system* (KMS). This was recognized by Thomas Clark and colleagues in 2007, when they defined MSS to include DSS, EIS, BIS, and KMS (Clark, Jones, and Armstrong, 2007). As expressed in the opening statement, this current research uses a much wider definition of MSS to include SIS, ES, DSS, EIS, BIS, ERPS, and KMS.

2. SUMMARY OF SEMINAL AND RECENT WORKS

In addressing the research questions, a number of seminal and/or recent scholarly works are examined for content, strategies, clues, and direction. Figure 1 provides a summarized listing of these works. In viewing this summary, four points are worth noting:

a. Since their introduction, SISs and ESs have developed into mainstream sub-fields of computer science (CS). They are typically taught through various courses in undergraduate and graduate programs in the field.
b. Like SISs and ESs, DSSs are often taught in CS and management programs (mostly at the graduate level), but not as predominantly as SISs and ESs.

c. MSS projects find application in virtually all aspects of management and niches of business. For this reason, most scholarly resources (articles and/or books) tend to adopt a generic approach rather than placing specific focus on a single business niche or aspect of management.
d. Most of the resources in the list are focused on encouraging and/or attaining successful implementation of MSSs in business environments; the widely accepted presumption is that these systems are useful to business and management.

These works are examined in more detail in the upcoming section (in roughly the order that they appear in the figure).

Figure 1: Summary of Seminal and/or Recent Works on Management Support Systems

Scholarly Resources on the Management Support Systems Family		
Management Support Systems (MSSs)		
Title	**Author(s)**	**Main Contribution**
The Dynamic Structure of Management Support Systems: Theory Development, Research Focus, and Direction	(Clark, Jones, & Armstrong, 2007)	Proposes a theoretical framework for management support systems (MSSs) that may be applied to any system that qualifies as a MSS.
Integrating Management Support Systems into Strategic Information Systems Planning	(Henderson, Rockart, & Sifonis, 1987)	Proposes a strategic planning framework that builds around the organization's critical success factors (CSFs), enlisting critical information set to drive the CSFs.
Strategic Information Systems (SISs)		
Experiences in Strategic Information Systems Planning	(Earl, 1993)	Draws from empirical study to propose best practices for the implementation of SISs.
Strategic Information Systems	(Wiseman, 1988)	Introduces the theoretical framework for strategic information systems.
Expert Systems (ESs)		
Introduction to Expert Systems	(Jackson, 1999)	Comprehensive introduction to the theory, design, and construction of expert systems.
Fuzzy Expert Systems and Fuzzy Reasoning	(Siler & Buckley, 2005)	Comprehensive introduction to the theory, design, and construction of expert systems.
Decision Support Systems (DSSs)		
A Collaborative Decision Support Framework for Managing the Evolution of Virtual Enterprises	(Drissen-Silva, & Rabelo, 2009)	Draws from empirical study to introduce a decision support framework that provides a supporting methodology for collaborating members of a virtual enterprise (VE) during its evolution phase.
Decision Support Systems: An Organizational Perspective	(Keen & Morton, 1978)	Reputed as being among the first recorded scholarly work on decision support systems; it introduces the theoretical framework for decision support systems.
An Integrated Decision Support System for Global Manufacturing Coordination in the Automotive Industry	(Liu, Young, & Ding, 2010)	Draws from empirical study to propose an integrated decision support system (IDSS) that facilitates manufacturing managers making informed globally coordinated decisions.
Note: Italicized titles are books.		

Figure 1: Summary of Seminal and/or Recent Works on Management Support Systems (continued)

Scholarly Resources on the Management Support Systems Family		
Executive Information Systems (EISs)		
The Impact of Executive Information Systems on Organizational Design, Intelligence, and Decision Making	(Leidner & Elam, 1995)	Reports empirically that the use of decision support technologies can lead to improved organizational intelligence and decision making.
Executive Support Systems	(Rockart & DeLong, 1988)	Introduces the theoretical framework for executive support systems.
Knowledge Management Systems (KMSs)		
The Influence of Knowledge Management System (KMS) on Enhancing Decision Making Process (DMP)	(Mohammed & Jalal, 2011)	Reports empirically that knowledge sharing enhances the decision making process.
A Framework for Quality Dimensions of Knowledge Management Systems	(Owlia, 2010)	Proposes a conceptual framework for managing the quality dimensions of knowledge management systems.
Business Intelligence Systems (BISs)		
Conceptual Model of Business Value of Business Intelligence Systems	(Popovic, Turk, & Jaklic, 2010)	Proposes a conceptual model to assess business value of business intelligence systems
Business Intelligence Best Practices for Success	(Woodside, 2011)	Draws from empirical study to propose a model for successful BIS implementation that includes a set of implementation factors that affect a set of success factors.
Enterprise Resource Planning Systems (ERPSs)		
Developing ERP Systems Success Model for the Construction Industry	(Chung, Skibniewski, & Hwak, 2007)	Proposes a conceptual ERP success model consisting of three main components: success factors, intermediate constructs, and success indicators.
Economic Benefits of Enterprise Resource Planning Systems: Some Empirical Evidence	(Matolcsy, Booth, & Wieder, 2005)	Reports that based on empirical evidence, the adoption of ERP can lead to sustained operational efficiencies, improved overall liquidity, increased profitability, and improvements in accounts receivable management.
Note: Italicized titles are books.		

3. SURVEY OF THE RELATED LITERATURE: SEMINAL AND RECENT WORKS

In examining the extant literature on MSSs and the related members of this family of software systems, it becomes apparent that there is widespread acceptance of these systems in various niches of business and aspects of management. The examination commences with a look at the generic MSSs and extends to specific members of the family of software systems.

3.1 Management Support Systems

An appropriate starting point for a discussion on MSSs is the work of John Henderson, John Rockart, and John Sifonis (1987). This theoretical, qualitative article underscores the importance of companies using information technology and services as a strategic advantage; it also represents a launching point for the term "management support systems." The paper proposes a strategic planning framework that builds around the organization's *critical success factors* (CSFs), enlisting critical information to drive the CSFs. According to the authors, that strategy should yield a strategic information infrastructure, consisting of the various constituent MSSs. The CSFs refer to the factors defined by executives of an organization to ensure its success. The authors draw from various contributors including Porter's (1980) emphasis on the strategic value of information services and Rockart's (1979) initial work on CSFs, in making the argument that software systems can be developed based on the determined CSFs of the host organizations, to yield the competitive advantage needed. Since the time of writing, the definition of MSS has been expanded to include other systems. However, the paper's primary function of establishing the CSFs as the starting point in the design, construction, implementation, and subsequent assessment of MSSs is significant.

The qualitative article by Thomas Clark, Mary Jones, and Curtis Armstrong (2007) proposes a theoretical framework for MSSs that may be applied to any system that qualifies as an MSS. Included in the framework are the following system assessment criteria: executive commitment, perceived benefits, management decision quality, user involvement in development, user commitment, system cost, system usability, system functionality, user knowledge base available, user knowledge base required, training, problem space match, technology gap, technology desired, technology available, and development effort. The paper provides an expansive definition of MSSs as software systems that facilitate good decision making in the organization — spanning DSSs, EISs, BISs, and KMSs. The paper conducts an extensive literature review, drawing from contributors such as Keen and Morton (1978), Rockart and DeLong (1988), Power (2007), and Watson, Rainer, & Koh (1991). One potential area of weakness is that the proposed framework appears not to place enough emphasis on the importance of the underlying database, which forms the backbone of the information infrastructure.

3.2 Strategic Information Systems

Strategic information systems (SISs) constitute a very important member of the MSS family. Charles Wiseman's seminal book, *Strategic Information Systems*, signals the beginning of an era of increased interest in such software systems (Wiseman, 1988). This book introduces the theoretical framework for SISs. The book defines a SIS as a software system that is designed to be aligned with the corporate and strategic vision of an organization or group of related organizations, thus giving strategic and competitive advantages to the host organization(s). Due to the significance and pervasiveness of SISs, the contemporary practice is to include SIS courses in computer science and/or management curricula in many higher education institutions.

In the empirical study entitled "Experiences in Strategic Information Systems Planning", Michael Earl (1993) records his findings after studying the experiences of 27 large corporations in planning and implementing their respective SIS projects. He observed five common approaches to the implementation of SISs — a business-led approach, a method-driven approach, an administration-led approach, a technological approach, and an organizational approach. Earl's conclusions were as follows: SIS planning requires a holistic perspective; successful SIS requires total buy-in and participation from the organization; the organizational approach appears to be the most effective. Upon scrutiny, one notices an encouraging corroboration back to the

idea of determining the CSFs as espoused in earlier works (Henderson, Rockart, & Sifonis, 1987; Rockart & DeLong, 1988).

3.3 Expert Systems

Another stable member of the MSS family is the group of software systems called expert systems (ESs). An ES is a software system that emulates a human expert in a particular problem domain. The classic text, *Introduction to Expert Systems*, by Peter Jackson (1999), represents a significant work in this area. The text provides a comprehensive introduction to the theory, design, and construction of expert systems. Expert systems have become a pervasive feature of twenty first century lifestyle. Consequently, ES courses typically form part of the computer science curriculum in many colleges and universities.

3.4 Decision Support Systems

Credit for the seminal breakthrough in decision support systems (DSSs) goes to Peter Keen and Michael Scott Morton (1978) for their book, *Decision Support Systems: an Organizational Perspective*. This book is reputed as being among the first recorded scholarly work on DSSs; it introduces the theoretical framework for DSSs. The book defines a DSS as a software system that provides information that enables managers and executives to make informed decisions, and then goes on to methodically build the theory of design, construction, and management of such systems. The book also argues that a DSS should be pursued in the context of organizational reality and collaboration among the stakeholders. Like the sub-fields of SIS and ES, DSS courses appear in many contemporary tertiary level curricula in CS and management.

In their mixed study on DSS for the manufacturing automobile environment, Liu, Young, and Ding (2010) drew from a DSS project that was used as a case study to propose an integrated decision support system (IDSS) that facilitates manufacturing managers making informed globally coordinated decisions. This IDSS consists of four subsystems — a Global Context Modeler (GCM) for consideration of various contextual decision criteria; a Multi-Criteria Scoring Modeler (MCSM) for consideration of various business decision criteria; a configurator for organizing the facilities and decision criteria into an organizational network; and a coordinator for managing the various decision hierarchies. Additionally, the IDSS is superimposed on an existing information infrastructure consisting of a database management system (DBMS), a mode base management system (MBMS), and a user interaction management sub-system (UIMS). Based on the empirical results observed, the paper concludes that the proposed decision model was useful for the specific manufacturing context studied. In building the theoretical framework for the project, the authors make reference to Keen and Morton (1978) in emphasizing collaboration among stakeholders.

Another positive endorsement of DSSs comes from Marcus Drissen-Silva and Ricardo Rabelo (2009). Drawing from a DSS project that was used as a case study, their paper introduces a decision support framework that provides a supporting methodology for collaborating members of a virtual enterprise during its evolution phase. The framework supports virtual enterprise (VE) evolution management. They define a VE as "a dynamic … logical aggregation of autonomous enterprises that collaborate with each other to attend a given business opportunity or to cope with a specific need, where partners share risks, costs and benefits..." (p. 4833 – 4834). The proposed DSS framework supports VE principles of autonomy and heterogeneity of members, decentralized decision-making, governance, information sharing, and uniqueness. The framework's architecture features a sophisticated DSS, and identifies performance measurement benchmarks via two standards — the Balance Scorecard (BSC) and the Supply Chain Operation Reference (SCOR) as defined by the international body called the Supply Chain Council (2005). One important point to note is that performance of the DSS is

tied to the supply chain, which is generally understood to be intricately linked to the [generic] organization's CSFs, thus establishing a link back to the seminal works associated with MSS (Henderson, Rockart, & Sifonis, 1987; Rockart & DeLong, 1988).

3.5 Executive Information Systems

Another member of the MSS family is the group referred to as executive information systems (EISs) or executive support systems (ESSs). An EIS/ESS is a special DSS that focuses exclusively on information reaching the business executive. The book, *Executive Support Systems*, by Rockart and DeLong (1988), introduces the theoretical grounding for such support systems, and is regarded as seminal in this area. Like Henderson, Rockart, and Sifonis (1987) and Rockart (1979), it advocates that design of an EIS begins with identifying the CSFs of the target organization.

The paper by Dorothy Leidner and Joyce Elam (1995) reports empirical support for the proposition that "the use of decision support technologies can lead to improved organizational intelligence and decision making outcomes" (p. 659). The study also finds that executives and middle managers perceive information to be more available if they are using an EIS than if they are not. The areas of functionality assessed were speed of problem identification, speed of decision making, availability of information, and involvement of subordinates in the decision making. Since the criteria of organizational intelligence and informed decision making may be regarded as among the most important CSFs, the finding therefore corroborates with earlier mentioned work on related issues (Henderson, Rockart, & Sifonis, 1987; Rockart & DeLong, 1988). Based on the finding, the paper proposes a conceptual model showing that the availability of advanced information technologies has a direct positive effect on the efficiency of the decision making capacity of managers.

3.6 Business Intelligence Systems

The next member of the MSS family is the group of business intelligence systems (BISs). Business intelligence (BI) defines a set of technologies that allow a business to operate on relevant information that is made available to its decision makers. In attempting to promote more accurate evaluation of the effectiveness of BIS projects, Aleš Popovic, Tomaž Turk, and Jurij Jaklic (2010) join forces to propose a conceptual model for assessing the business value of BIS projects. The model consists of five main component contributors: system maturity, information quality, BIS absorbability, business processes, and business performance — the implication being that business performance is affected by the other four determining factors. While the paper exhibits some elements of speculative argumentation, the proposed model identifies five important determinants of business performance within the context of a BIS environment. These determinants tie back nicely with the concept of CSFs of earlier discussions (in section 3.1).

Drawing from the findings of an empirical survey involving 148 respondents from a national healthcare organization, Joseph Woodside (2011) proposes a model for successful BIS implementation that includes a set of eight implementation factors that affect a set of three success factors. The implementation factors are collaborative culture, customization, communication, project management, resources, management support, training, and vertical integration. The success factors are perceived success, timely implementation, and satisfaction. Through empirical test of eight hypotheses (each corresponding to an implementation factor), Woodside reports that each implementation factor is a determinant of BI implementation success. Since Woodside's implementation factors may be incorporated into a comprehensive set of CSFs, the connection of this work back to the original seminal works (Clark, Jones, & Armstrong, 2007; Henderson, Rockart, & Sifonis, 1987; Rockart & DeLong, 1988) is noticeable.

3.7 Enterprise Resource Planning Systems

Enterprise resource planning systems (ERPSs) also belong to the family of MSSs. An ERPS is a comprehensive software system that facilitates strategic management in all the main areas of operation of a business enterprise. The ERPS typically includes several interrelated sub-systems each of which may qualify as a software system in its own right. The usage of ERPSs has increased significantly over the past two decades. How effective are they? Zoltan Matolcsy, Peter Booth, and Bernhard Wieder (2005) join forces to address this question. Based on the empirical evidence examined, the paper posits that the adoption of ERP systems in companies can lead to sustained operational efficiencies, improved overall liquidity, increased profitability, and improvements in accounts receivable management. The paper establishes a theoretical frame of reference by drawing from the Dehning & Richardson (2002) framework, which states that a firm's financial performance is a function of its investment in information technology, contextual factors, and internal business processes. The authors also draw from Michael Porter's (1985) value chain model, which establishes a causal relationship between a firm's inbound logistics, operations, and infrastructure with its revenue performance. The research observed the following performance factors for profitability: inventory turnover; fixed asset turnover; marketing, sales, and distribution; profitability; and liquidity. A total of 35 companies were studied over a period of two years. Companies that applied ERP systems showed an improvement in the areas evaluated compared to those that did not. The observed performance criteria may be incorporated into a comprehensive set of CSFs, thus establishing a connection back to the original seminal works (Henderson, Rockart, & Sifonis, 1987; Rockart & DeLong, 1988).

The article resulting from the mixed study by BooYoung Chung, Mirosław Skibniewski, and Young Hoon Kwak (2009) proposes a conceptual ERP success model consisting of three main components: (1) success factors consisting of output quality, image/status from use of the system, result demonstrability, job relevance with respect to the system, compatibility, reliability, internal support, consultant support, and functionality; (2) intermediate constructs consisting of subjective norm, perceived usefulness, and ease of usage; (3) success indicators including use/intention to use, ERP benefits, and project success. The article also draws from an extensive literature review including the work of DeLone and McLean (1992), Venkatesh and Davis (2000), and Davis, Bagozzi, and Warshaw (1989) concerning the technology acceptance model (TAM). As with the previously mentioned work, the practice of connecting the ERPS implementation to the organization's CSFs resonates with the earlier seminal works on MSSs (Clark, Jones, & Armstrong, 2007; Henderson, Rockart, & Sifonis, 1987; Rockart & DeLong, 1988).

3.8 Knowledge Management Systems

The new and emerging group of software systems called knowledge management systems (KMSs) represents the latest addition to the MSS family. These systems have emerged out of the need for organizations to have access much larger volumes of (often unstructured) information than at any point in the past. Mohammad Owlia (2010) writes an interesting qualitative, theoretical paper focusing on the quality dimensions of such systems. The paper proposes a conceptual framework for managing the quality dimensions of KMSs, consisting of eight dimensions — functionality, completeness, reliability, usability, access, serviceability, flexibility, and security. These dimensions are well-known in the field of CS as part of a larger list of software quality factors that includes additional factors of efficiency, documentation, compatibility, integrity, growth potential, adaptability, differentiation, and productivity (Foster, 2014, p. 16 – 17, 244 – 246). Owila observes that despite the growing number of successfully implemented KMS projects, based on earlier studies, "many organizations have failed to realize the expected benefits of KM" (Owlia, 2010, p. 1215). He argues further that this is in part due to the difficulty in measuring KM, and that improving the quality of KMS could help alleviate

this difficulty. The paper draws from Alavi and Leidner (2001), to define KM as "the process of creating, storing, retrieving, transferring and applying knowledge; this includes creating internal knowledge, acquiring external knowledge, storing knowledge in documents and routines, updating knowledge, and sharing knowledge internally and externally" (Owlia, 2010, p. 1216). The paper identifies a comprehensive set of KMS quality dimensions; the author then uses this information to propose a conceptual framework for quality dimensions of KMSs.

4. OBSERVATIONS AND PROPOSED MSS EVALUATION FRAMEWORK

The foregoing literature review has led to the following five observations:

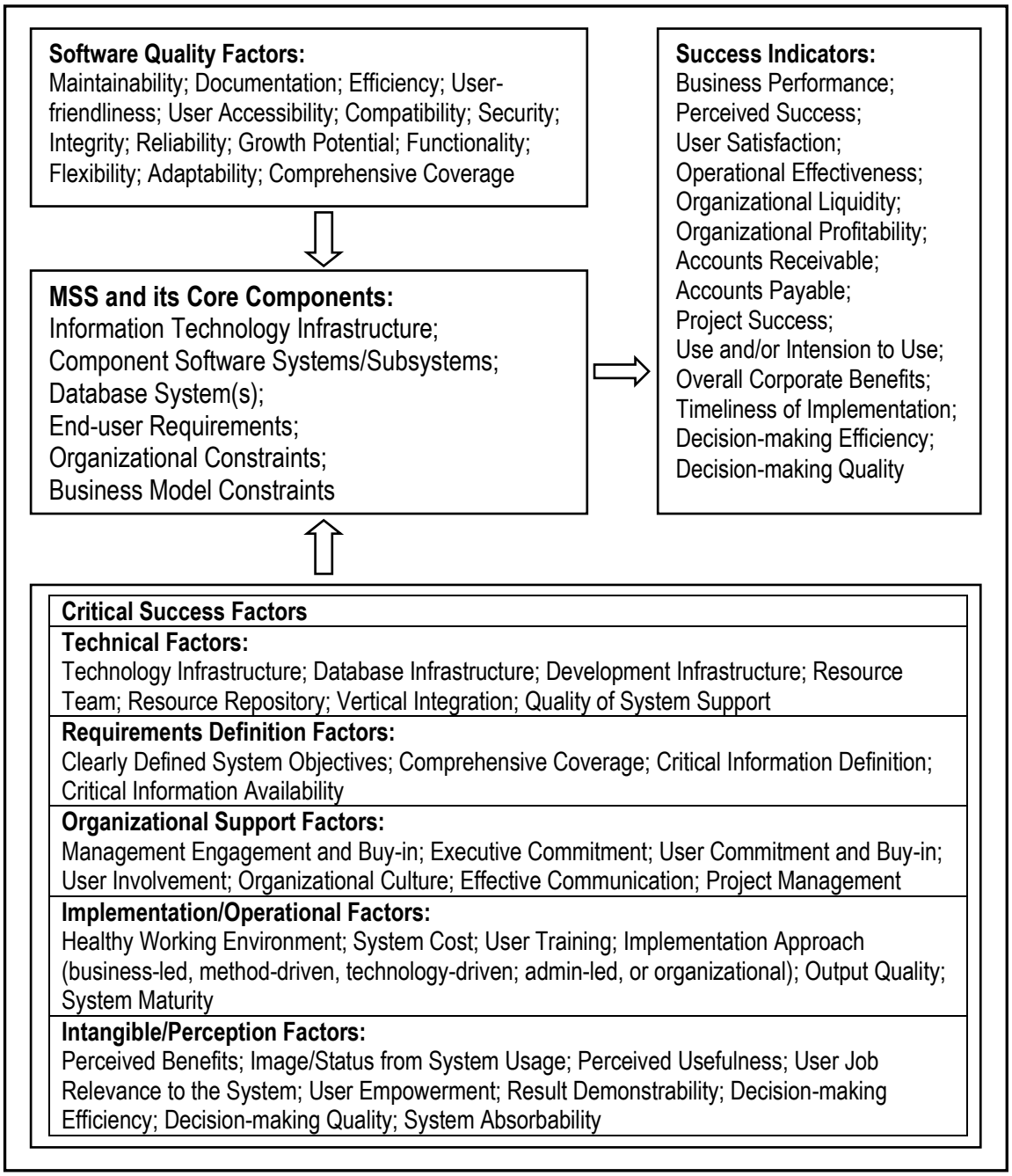
a. There is widespread acceptance of the relevance of MSSs in the business community. This is true in virtually all aspects of business — from manufacturing (Liu, Young, & Ding, 2010; Drissen-Silva, & Rabelo, 2009) to higher education (King, Kvavik, & Voloudakis, 2002).
b. As an extension of the previous observation, three members of the MSS family — SISs, ESs, and DSSs — have become accepted as part of mainstream computer science curricula in higher education (for example, see Jackson, 1999; Siler & Buckley, 2005; Wiseman, 1988).
c. It has been widely accepted in the literature that design of MSSs is contingent on identification of CSFs of the organization(s) they are intended to serve; it is also widely accepted that the CSFs are also needed for evaluation of the impact of such systems (Henderson, Rockart, & Sifonis, 1987; Clark, Jones, & Armstrong, 2007; Rockart & DeLong, 1988; Popovic, Turk, & Jaklic, 2010; Woodside, 2011). However, the literature also shows that there is no widespread agreement on what those CSFs are; while many of them are standard for various business organizations, there are others that are idiosyncratic to the host organizations they serve.
d. In addition to CSFs, the success and impact of MSSs is also contingent on the quality of the system design (Owlia, 2010; Foster, 2014, p. 16 – 17, 244 – 246).
e. Several empirical studies have shown MSSs to be effective in improving management effectiveness in areas such as user satisfaction, profitability, liquidity, decision making, and accounts receivable (Leidner & Elam, 1995; Mohammed & Jalal, 2011; Woodside, 2011; Matolcsy, Booth, & Wieder, 2005).

Despite these positive findings, there appears to be consensus among researchers of MSSs that additional work is needed in defining models that more accurately assess the impact of these systems. Against this background, this paper proposes an MSS evaluation framework consisting of three main components: a critical success factors (CSFs) component, a quality factors (QFs) component, and a success indicators (SIs) component. Figure 2 provides an illustration of the framework. As shown in the figure, the impact of the MSS may be measured via its success indicators. These indicators are impacted by the system's performance with respect to the quality factors and the critical success factors. The figure also includes the essential components of the MSS environment — the information technology (IT) infrastructure, component software system(s) and/or subsystem(s), database system(s), end-user requirements, organizational constraints, and business model constraints.

The QFs component provides a list of standard quality factors for software systems that therefore apply to MSSs. The quality factors include maintainability, documentation, efficiency, user-friendliness, user accessibility, compatibility, security, integrity, reliability, growth potential, functionality, flexibility, adaptability, and comprehensive coverage. These factors are well known to the field of software engineering. It is generally understood that when a software system satisfactorily meets these benchmarks, its value and impact are significantly enhanced.

The CSFs component provides a set of generic critical success factors for MSS projects. Critical success factors are varied and many; some of them may even be context sensitive, depending on the host organization to which they apply. Nonetheless, it is possible to identify CSFs that are applicable in most organizational circumstances. Figure 2 lists these generic CSFs under the categories of technical factors, requirements definition factors, organizational support factors, implementation/operational factors, and intangible/perception factors. Management support systems that satisfactorily meet these CSFs benchmark are virtually guaranteed to be successful and impactful to their host organizations. However, please note that each host organization or researcher has the liberty to determine which CSFs are relevant to the scenario of interest; the CSFs list may therefore be expanded or shrunk to meet the specific needs of the scenario in which the model is applied.

Figure 2: Illustrating the Proposed MSS Evaluation Framework



Turning to the SIs component, the framework offers a set of success indicators that includes business performance, perceived success, user satisfaction, operational effectiveness, organizational liquidity, organizational profitability, accounts receivable, accounts payable, project success, use and/or intension to use, overall corporate benefits, timeliness of implementation, decision-making efficiency, and decision-making quality. Successful MSS projects will show positive performance in these areas. Also note that decision-making efficiency and decision-making quality are listed as CSFs as well as success indicators. This is deliberate, reflecting the premium placed on the MSS impacting the decision-making capacity of managers in the organization. As is the case for the CSFs, the host organization or researcher has the liberty of choosing which success indicators to focus on.

This framework should attract attention from two interest groups. Firstly, business executives who are involved or have an interest in the implementation of MSS projects may use it as a guide through their planning and implementation of their respective projects. They may also decide on framework criteria that they desire to monitor during the life cycle of their MSS projects. Secondly, researchers may use this framework as the basis for subsequent research.

5. SUMMARY AND RECOMMENDATIONS FOR FUTURE RESEARCH

This paper has examined the impact of management support systems on contemporary management through a comprehensive survey of a wide range of scholarly resources on or around the topic. Analysis of the extant literature has led to the following conclusions:

a. There is widespread acceptance of the relevance of MSSs in the business community.
b. Three members of the MSS family—strategic information systems, expert systems, and decision support systems — have been accepted as mainstream components of a typical computer science curriculum.
c. The success of a typical MSS project is contingent on acceptable performance on a wide range of critical success factors and software quality factors.
d. Empirical studies have shown MSS projects to be effective to contemporary management in areas such as user satisfaction, profitability, liquidity, decision making, accounts receivable, business performance, etc.
e. There is a need for more deterministic models that can assist in more accurate assessment of the impact of MSS projects.

On the basis of this finding, this paper has introduced an MSS evaluation framework consisting of a critical success factors (CSFs) component, a quality factors (QFs) component, and a success indicators (SIs) component. The CSFs component lists generic CSFs for the MSS project; the QFs component lists standard software quality factors for the project; the SIs component lists criteria for evaluating the success of the project.

This work is not without limitations. The proposed MSS evaluation framework has been advanced based primarily on the extensive literature review that was conducted. While the proposed framework draws from the contributions of various seminal and/or scholarly works, no empirical study has been conducted in its defense. Going forward, it will be necessary to conduct such studies:

a. One such study would be an investigation into the direct effect of the software QFs of the MSS evaluation framework on the success of the MSS project (review figure 2). The findings from such a study will be useful in guiding managers and executives in host organizations on product selection as well as in system customization.
b. Another prospective research is an inquiry into the direct impact of the CSFs on the success of the MSS project (review figure 2). Since the list of CSFs is somewhat large, this would likely require multiple

studies. The findings from these studies would significantly help managers to make more informed decisions about what CSFs to focus on during their respective MSS projects.

c. An empirical study could be conducted to determine the relative importance of the success indicators summarized in figure 2.
d. A fourth study could examine the combined effect of the QFs and the CSFs on various SIs in the MSS evaluation framework.

These four inquiries would significantly improve the landscape for MSSs by helping managers develop more confidence about their MSS projects and minimizing the occurrence of scope creep on such ventures. They will be pursued in subsequent research initiatives. In the interim, the proposed MSS evaluation framework should make a useful addition to the existing literature as we move towards more accurately measuring the impact of management support systems on contemporary management.

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