Why do Enterprise Information Systems Fail to Match the Reality?

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Abstract

Organizations are increasingly investing in complex enterprise information systems. In most cases, claims are made concerning how these expensive systems will produce considerable improvements in the operational performance of the organizations. However, there is evidence that many of these systems fail to deliver the expected outcomes and often fail completely. This study explores the linkages among operational performance, system effectiveness, and the organizational factors that influence the balance that these systems require. This research uses a qualitative approach, based on unstructured interviews with healthcare workers at different levels of the organization, to build on the existing literature and to further confirm and refine a theoretical framework.

1. Introduction

Many organizations such as in healthcare industry are investing substantial resources in enterprise information systems (EIS), but the extent to which they enhance the organization’s performance is not yet well understood. There is an expectation that EIS will increase a firm’s operational effectiveness (e.g., decrease operational costs, increase flexibility and reliability of the service, and improve quality of the service). There is also often an expectation that EIS will not only boost profitability [1], but also to ensure the firm’s sustainability. It is important to obtain a better understanding of stakeholder’s expectations in regards to the operational performance, and how implementing EIS can improve operational effectiveness [2]. Improving operational effectiveness involves determining key performance objectives and establishing benchmarks. However, some organizations are failing to benefit because they either do not measure performance objectives or do not measure them properly [3].

Effectiveness needs to be measured from an information systems (IS) perspective. System effectiveness can be defined as the extent to which implementing an EIS contributes to achieving the expected organizational goals and benefits [4]. In the context of EIS, effectiveness is the accuracy and completeness with which users achieve agreed goals [5].

Implementation of EIS has become increasingly important as companies come under heightened regulator scrutiny. The advent of EIS has also allowed companies to automate procedures and support their activities and decision making processes. As a result of growing concerns about the effectiveness of EIS, there is a need to evaluate them in order to demonstrate real benefits to the operational performance inside organizations. Many organizations that dedicate resources to IS expect productivity to improve [1], however adopting EIS to meet organizational objectives is not easy. Identifying the organizational objectives that can improve performance requires an understanding of the organization’s core capabilities as well as its market needs and how they are aligned with the so called strategic triangle [6].

This research explores the nature of the balance between system effectiveness and operational effectiveness that needs to exist in any healthcare organization after the implementation of an EIS. In addition, the influence of organizational factors in balancing system effectiveness and operational performance is explored. In order to have a better understanding of our question “Why do Enterprise Information Systems Fail to Match the Reality?”, our research is trying to address the following questions: which performance objectives and systems dimensions do organizations take into consideration when implementing EIS?, and, is there any balance between operational effectiveness and systems effectiveness?

2. Background

An EIS is an organization-wide system that enables people to communicate with each other and access appropriate data through the whole enterprise [7]. Most EIS are commercial software packages that can be used, when successfully implemented, to manage and integrate all business functions of all departments into a single computer system that can serve the entire enterprise’s needs [7]. An EIS system can consist of a number of integrated functions such as manufacturing, logistics, distribution, finance, accounting, marketing, and human resources.

The implementation of EIS is problematical because of the generic off-the-shelf nature of most systems. Sumner [8] suggests that in some cases, it is better to fit
business processes to the EIS package rather than try to customize the package. It is the vendor who defines the requirements of the business as they claim to have analyzed similar organizations’ characteristics and written a system solution that can be adapted, just by changing the configuration or some parameters [9]. In essence the organization can choose the modules that will fit their needs and then they can configure the module to their particular requirements [9]. By making changes to fit an EIS managers do not realize that they are impacting other areas or functions of the system that were not designed for that particular process. A study reported by Soh, Kien and Tay-Yap [10] in public hospitals in Asia Pacific indicates that few EIS consultants understand their client’s business processes sufficiently to highlight all critical areas of mismatches. Their finding suggests that the misfit issue may be worse in Asia because the business models underlying most EIS packages reflect European or U.S. industry practices. Operational misfits occur when normal operational steps are missing or inappropriate due to the incompatibility of the embedded business model. Changes in the system can also affect the organizational culture. When organizations are innovative and flexible, it is very likely that staff will attempt to modify the system as they improve processes (operational effectiveness) in the organization. This can harm the overall operability of the system, if the system is not flexible enough to effectively incorporate these changes.

The paradigm for investment in EIS has changed; it used to be that a business would invest wholly in system effectiveness by designing a unique system for themselves based on their own requirements, now, through the availability of packaged EIS, enterprises must find the balance between redefining their operations (managing operational effectiveness) and changing the packaged EIS (examining system effectiveness).

2.1. System effectiveness

System effectiveness can be described as the extent to which information systems contribute to achieving organizational goals and benefits [11]. Companies deriving the greatest benefits from their systems are those that, from the start, viewed them primarily in strategic and organizational terms. These companies stressed the importance of the enterprise not the system [9]. Some case studies reported by Masini [1] show the EIS adoption as successful as they brought the expected benefits, but also induced important modifications in the firm’s business model. Some of the expected benefits identified by Masini [1] are: homogenization of information and its timely availability, significant reduction of data entry points with a consequent decrease of potential inconsistencies and errors, and better utilization of resources. According to Hesseldenz & Morefield [12], many organizations report new organizational capabilities and a considerable improvement in different operational areas. The new EIS has also helped the institution to enhance its ability to adapt to change, create new knowledge and performance measures, and even identify a new strategic horizon.

The high failure rate in implementing such systems is a major concern [9]. The medical informatics literature presents, by and large, a picture of successful implementation of health information systems (HIS). Nevertheless, the current literature fails to report the failures found after implementation of information systems [13]. Failure rates for large-scale system development projects are extremely high and many information system projects are failing to achieve their advertised outcomes [14]. However, as it is difficult to quantify, the real level of information system failure could be far greater than is reported [14]. An EIS project has failed if the solution does not integrate well with the business environment, if there is a lack of consistency between the initial requirements and final solution, or if the project simply does not make business sense.

The issue of how to measure success or failure is not easy as the success or failure of a system is subjective and is seen as a matter of interpretation and that interpretation can change over time [15]. Success depends on the point of view from which you measure it. Stakeholders often address different issues when discussing EIS success [16]. Another issue arises when measuring success at different points in time. Larsen and Myers [17] found that an EIS implementation could be an early success and a later failure. Also, Parr and Shanks [18] reported a case study that was initially unsuccessful and later successful. Furthermore, there is a need for organizations to be successful in all the different phases of an EIS implementation [16]. Measuring success of information systems has been a concern for those within the information systems discipline. Although success is complex, and therefore difficult to measure, researchers have made efforts to identify dimensions and measures that facilitate the process of understanding information systems success. Note that, due to the multitude of different approaches to the measurement of information systems success, it is unlikely that a single measure of EIS effectiveness can be agreed upon and, therefore there is a need for multiple dimensions (measures).

The revised DeLone and McLean’s model [19] includes six interrelated dimensions of information systems success: information quality, system quality, service quality, intention to use, user satisfaction, and
net benefit as dimensions to measure the dependent variable IS effectiveness. In essence in the DeLone and McLean [11] success model: system quality measures technical efficacy – the desired characteristics of the system. This assessment is based on the performance and productivity of the system [19]; information quality is the measurement of output from EIS. This measures semantic success – characteristics of the information and its desired form [19]; use and user satisfaction measure effectiveness success – studies that attempt to analyze and measure the interaction of the information product with its recipients. User satisfaction is defined as user’s response to the use of the output of an EIS; it is the psychological state after the use of an EIS [19]; individual impact is the effect the information has on the behavior of the user including improving personal or departmental performance. It relates to what influences the information product has on management decisions [19]. This impact occurs when the information is received and understood by the users, and applied to their jobs; organizational impact derives from research that investigated the effect of the information product on organizational performance [19]. However in measuring performance it is important to have a clear understanding of the outcomes from the investment of a significant amount of human and economic resources in EIS solutions that cannot always be properly adapted to particular circumstances. EIS effectiveness should be measured in terms of the real operational benefits rather than through the achievement of information systems outcomes only. In attempting to address these questions we need to understand key elements of its relationship to system effectiveness and the links between operational effectiveness and system effectiveness, but it is also important to consider how organizational factors and strategies affect this relationship or linkages.

2.2. Operational effectiveness

An increasing number of factors are prompting organizations to seek to operate more efficiently and to ensure they have effective operational processes [2]. This involves the need to deliver value adding services of exceptional quality, on time. Thus, organizations attempting to meet these objectives need to pay attention to their operational effectiveness as this is a primary driver of organization’s performance [2]. Operational effectiveness refers to the ability of setting processes, based on core capabilities within the organizations, which work well [20]. Operational effectiveness involves improving process performance by leading and controlling the processes within the organization as well as measuring and improving the processes. A better use of resources through these core processes enables the organization to eliminate waste, adapt more appropriate technology and therefore perform better than others [20]. Performance is considered a judgmental assessment of the organization’s performance relative to benchmarks in a certain period. Adequate measuring of performance enables organization to continuously and systematically seek out opportunities to improve.

The five performance dimensions or objectives an organization seeks to fulfill to attain operational effectiveness include cost, quality, flexibility, speed and dependability [21]. Creating improved organizations is not an overnight task. Improving on cost means that an organization seeks the elimination of waste which comes from efficiencies attained in processes such as purchasing, production, and staff performance. An appropriate disaggregation of the cost components impacting on the total cost performance of an organization gives the opportunity to identify the areas for improvement [2]. Furthermore, improving on quality provides an opportunity to bridge the gap of what organizations are capable of offering and what customers demand. That is, viewing quality as a consistent provision of services that satisfy customers rather than only conforming to specifications without any clear continuous improvement. The third operational performance objective concerns being flexible which includes an organization’s ability and extent to adjust to changes to respond to customers [22]. Additionally, improving on speed prompts an organization to be able to shorten the time between the service request and service reception and to deliver a service with the frequency and at the time that a customer requests [21]. Finally, reliability suggests that an organization’s processes consistently perform as expected over time. That is, customers are satisfied by organizations that provide services that do not fail over a period of time or with services that are delivered as has been agreed [20].

Some of the reasons for measuring performance encompass the improvement of productivity, identifying where problems exist and where improvements are necessary as well as showing if planned improvements actually happened [21], addressing the issues of where the organization wants to go, how to get there and knowing that it got there, encouraging long-term thinking perspectives, supports, enhancing improvements as well as better resource allocation. Other research suggests that due to factors impacting on organizations during the last decade such as the increasing changes in the business environment, changing organizational roles and changing external demands have been prompting organizations’ need to have a more holistic and proactive approach to performance measurement. This holistic approach involves the setting of performance measures by considering not only the shareholders’ and customers’
needs, which to a great extent is included in Kaplan and Norton’s [23] balance score card framework, but also by taking into consideration other stakeholders.

2.3. Information system strategy implementation

Strategic planning is crucial in the management of healthcare organizations, even when the characteristics of healthcare systems vary. Public and private hospitals are called to continuously improve their managerial processes, with particular attention to the efficacy of strategic planning models applied [32]. Health care delivery organizations are notoriously ineffective in adopting and applying new technologies. But they ultimately tend to utilize innovations in both the clinical and managerial aspects of their existence [33]. One of the well-recognized pitfalls of the strategic planning process approach is related to existing dualism between “formulation” and “implementation” phases. Internal organizational conditions, emerging strategies, and changes in external environment typically place the implementation phase in jeopardy. This problem seems to be harder to solve in the case of hospitals [32]. Hospitals are viewed as a loosely coupled system [32].

The effectiveness of a strategic planning process can be measured by its ability to produce maximum value for different stakeholders in the health system. The strategic planning process has particular connotations in health organizations. The goal is to create within the hospital a competitive arena of innovative ideas that in some respect helps to get sponsorship from management and their business strategic plans [32].

Information systems must support business goals, and also the organizational systems. There are a number of steps that need to be performed before IS strategic policy is investigated and implemented. If the EIS has a strategic role as discussed above, IS strategies must begin by understanding how other stakeholders see the role of IS. Based on the current view of stakeholders, the IS departments must define the role that IS must have and achieve in the case organization. If the case organization is to grow and improve its performance, the IS strategy must be linked to the organizational strategy and performance indicators. Strategy begins by defining what the role must be of IS at present, in 5 years and in 10 years. Beyond scoping roles, a bottom-up definition of core IS functions are required. Once the role and functions of IS have been identified, it is essential that objectives are identified and performance targets defined that will allow the IS to demonstrate its strategic value and importance to the organization. In setting objectives, IS has to determine the role that it will play and what functions are that need to be delivered to achieve the performance targets set. The research and analysis of documentation indicates an awareness of this by top managers of the organization. However, it is important to emphasize that research indicates that in uncertain environments subject to ongoing change, a phased information strategy implementation is more successful (or less risky) than single-step organizational change [34]. As part of this process, the case organization should see the overall business strategy that drives both organizational strategy and IS strategy, and carefully balance these three strategies.

3. Research Issues and Methodology

As the study seeks to address research questions this suggests the adoption of an exploratory approach [24]. Case study is selected as methodology useful for studying a contemporary phenomenon in a real world context and creating and refining theory [25]. Case research moves away from rigor towards practicality, which may suggest more relevance for practitioners. This research uses the interpretivist philosophical perspective and its particular implications for data collection and analysis methods and research outcomes [24] because the interpretivist approach is commonly used by social science as its emphasis is on empathetic understanding of human behavior and actions [26]. It attempts to understand phenomena through meanings that people assign to them through processes where the IS influences and is influenced by the context [27].

To ensure the rigor and accuracy of information, this case study research used unstructured interviews to identify preliminary issues and variables that were then investigated in more detail using semi-structured interviews. In addition, triangulation methodology was used through analysis of the company’s documentation related to the information strategy and post implementation reports [27]. Furthermore, semi-structured interviews were used to gather data required for the discussion process, and individual analysis of transcripts was made, which will be later integrated into researcher’s notes and transcript. Visits to observe the operations of different units in various hospitals, and interviews with healthcare industry participants were conducted in two federal states in Australia. They were purposely selected in order to cover a range of possible view points and all of them are users of EIS applications. The health organizations consider this information to be confidential and, as result, only summary information is provided in this study. The framework (shown in Figure 1 on the following page) of Santa, Ferrer and Hyland [28] was developed to show the balance between system effectiveness and operational effectiveness. The framework links the two parent theories of information systems and operations management.
4. Findings

Two EIS applications were identified in the Healthcare organizations in Australia. The first EIS, coded as **EIS-A**, is a patient management tracking system. The EIS-A enables location of the whereabouts of the hard copy of a patient's file (medical history) at any given time. As the patient moves through the hospital system from admission to x-ray, pathology, and various wards, their file travels the same path. If that file needs to be located, the EIS-A can provide a history of its movement. It does not record treatment or patient information, other than to place them in a particular department at a given time. Unfortunately, the EIS-A was not designed to be archival, or to store historical data. There may be instances where patients have only ten entries for as many years, but some patients may exceed that number in a few days. Entries for the former will remain on the live data base and would be readily accessible even though they are old. Entries for the latter, however, may not survive the monthly purge, and in that event they are eliminated from all records altogether [29]. Another issue with the EIS-A is that data is being centralized in the capital city of the State, and that is seen as inconvenient as all information comes out of the capital, so when data is entered into the end user computer, it goes through the server in the capital and back to the regional unit. This slows the system down quite dramatically.

5. Discussions

The results of interviews and analysis of the organizations’ documents confirm the existence of the dimensions for systems effectiveness and operational performance portrayed in Figure 1. The respondents identified a linkage between the quality of information and user satisfaction (system effectiveness) and the five performance objectives (operational effectiveness).

Firstly, the organization is operating at high cost. Interviewee RW states that “there are so many factors that influence the unit’s budget, for example the use of material. Medications are very, very expensive, especially cardiac medications. To deal with a heart attack you are talking about $5000 for the first medications you put to anti-coagulate a patient. I don’t think the budget is enough to cover the operations of the unit”.

Also it is not possible for stakeholders to rely on the quality of information to make effective decisions as the EIS application is not covering all the details of a particular clinical process. The lack of quality of information implies that continuous non value adding auditing processes are carried out to confirm that manual information matches what has been recorded in the system. “So there may be a lot of repetitive work, and they were going the long way around and wasting their time.” (Interviewee LD).

Secondly, the quality of services provided by the unit is seen as low by patients who are not receiving adequate care in some areas. “The workload may be similar, but the way the system is set up makes it a bit more difficult. So your coronary care patient might not need as many hours...but it will be automatically given more hours...but then your high dependency patient will...
Thirdly, the system has been regarded as not flexible enough because it does not enable users to enter vital data that will enhance the efficient report generation, workload allocation, and decision making in general. Flexibility related examples state: “...the system is too broad to be able to show the simple steps that you do in the unit...and lacks a lot of things that we do in the unit. Like when you categorize a patient, it gives you a list of tasks that you say, yes this has been done, this has been done but there are so many things that you do that are not covered in there.” (Interviewee RW). “…You can’t recognize that out of EISA, it won’t let you. A lot of fields when you enter something into EISB can’t be changed.” (Interviewee RW).

KS who is a chief nursing officer at Southern Health and is using the system, says, “... fixed ratios do not allow flexibility and don’t give you any capacity to respond to anyone’s condition deteriorating” [30]

Previous research shows that patient outcomes are depended on whether there are enough nurses with enough time in a unit or not, because nurses need to rescue patients from complications. KS says, “Not enough nurses, and/or a poorly run system, leads to a direct increase in these complications.” [30]

5.1. Speed - Efficiency

It does not seem that the EIS can provide efficiency to the work of nurses. Nurses often complain about spending too much time on the system rather than on patients. The interviewee LD says, “I think a lot of us see it as an extra job and they seem to reduce our efficiency – because not only do we deliver the care that is needed we then have to go in and prove that we have delivered the care – so that takes more time.” Also, “It does not seem to very effectively look after, particularly children’s work loads – even though there are care paths for children it does not predict very well the amount of time a child takes to look after. So they have major issues with it.” Another end user of the same system from a different health care organization also says the same thing, that she “understands why nurses fear this kind of system so much that they have closed hospital beds across the state in an effort to prevent its introduction......under EIS, nurses spent "lots of time" at the computer rather than at the bedside.” [30].

5.2. Reliability

The reliability issue comes from the high security of the EIS. High security is good for the system, but makes the EIS-A unavailable to end users all the time. Let’s see how the interviewee RW describes this situation: “One of the terrible things about it is that every three months your password changes – you have to change your password – if you don’t change your password you lose access, then you have to go to your Nurse Unit Manager (NUM), who has to sign you off again that you need access to that program – if you don’t access that program every two weeks – you’re frozen out of it, so if you go on holidays for a month, you automatically lose access. So then there are a lot of staff who don’t have access and can’t be bothered filling out a form, getting the NUM to do it.”

The framework [28] shown in Figure 1 was used in the study organization and assisted us to gain a better understanding of whether the EIS has failed to deliver good quality of information. Stakeholders at different levels are concerned with this issue as they cannot rely on the information provided by the system in the decision making process. Working with EIS-A and EIS-B, we have been able to identify a number of issues with healthcare EIS applications.

Figure 2 demonstrates that there is an imbalance between system effectiveness and operational effectiveness. It is bringing negative operational outcomes to the case study organizations. Furthermore we have identified an organizational factor - training - which should be included in the IS strategy, because it is affecting both system effectiveness and operational effectiveness.

Figure 2. Organizational factors and organizational imbalance

5.3. Quality - Training

Over the past few years there has been large investment in information technology (IT) in the health sector. However, at the same time there has been a lack of an equivalent investment in the education and
training needed in this area. One of the main challenges in applying IT is in delivering adequate training. This is especially relevant to the nursing profession, which has generally derived less in benefits from existing IT training programs [31], as the quality of the data depends on the quality of the training. We have found from our interviews that the lack of training is interfering with the efficiency of the use of the system in keeping the quality of the health system and providing efficient service to patients. The interviewee LD says, “… in the three main areas we use this system - a lot of the time the staff didn’t know shortcuts which were available, which would make it a lot quicker to access. They were not aware of things that they could claim, but they were not claiming – so that it accesses the needs of the patient or the time needed to look after that patient – but they were not using it properly. An example for that would be – if a patient had a 6 hourly IV therapy going, they could claim a first involved medication, but they weren’t using that – so they weren’t clicking that box which gave them an extra 10 minutes or 15 minutes of care which they would require to watch for that. Because of their staffing within the Hospital system – they are not learning an effective way of using it – it’s not being used effectively.” The point here is that due to the lack of quality training on the use of the system, nurses cannot provide optimal service to patients.

5.4. Other barriers

Another common barrier to the future development of EIS perceived by most of those addressed in this study was the resistance to changing their work practices. Other obstacles perceived by the actors were the budgetary constraints and bureaucracy involved in purchasing and introducing new technologies into the health care system [31].

6. Concluding remarks

Why is the relationship between operational effectiveness and system effectiveness so important to our original question? An optimal balance has a positive influence on the bottom line. The identification of appropriate systems dimensions and performance objectives become essential for continuous improvement. Although we were not expecting the importance of quality training in the use of the EIS, it has come up as a relevant factor or issue. Also, organizations need to recognize the significance of information system strategies and how well they align with business and organizational strategy. Healthcare providers and other organizations are increasingly looking for effective ways of cutting costs and allocating resources. Competition is constantly increasing so business and corporate strategies should be supported by this balance. However, if organizations do not properly study their operations, if they do not adapt the systems to the operational needs, if causes of user dissatisfaction are not evaluated, and information outcomes are not properly assessed so the causes of poor quality are detected and fixed, and finally, if the performance of operations and systems are not properly evaluated for continuous improvement, the organization is more likely to continue allocating resources on EIS that do not make business sense.

Our study reveals the need to incorporate new constructs in the framework which influences the optimal balance between system effectiveness and operational effectiveness when implementing any EIS. It is also important to explore more confirmatory interviews and statistical analysis to test the different linkages between system effectiveness and operational effectiveness.

7. References


