Analysis of Information System Capabilities on Organizational strategies

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ABSTRACT

Organizations over the years have exploited the capabilities of Information systems to achieve their objectives and many studies in the recent past have asserted productivity gains due to IT deployment in Information Systems functions reflecting organizational practices. However, practical observations into the organizational IS functionalities always reveals certain shortcomings and imperfections in the implemented systems exposing the gaps between desired features of IS and delivered features of IS. Based on the case study observation made with an Institute of Higher Education functioning in United Arab Emirates, these shortcomings are viewed in two dimensions such as techno-centric issues and human-centric issues on the implemented organizational IS. The details of the qualitative data extracted in this work reveal the organizational strategic imperatives exposing the potential gains and pitfalls of Information Systems capabilities.

Introduction

(i) Information System capability checking in organizations

The core issue in IS capability checking concentrates not only the deployment of superior IT products but also on assuring the relevance of IT usage to the organizational process components. The major issue organizations need to address in leveraging technology towards reaching a position of marketplace leadership is nothing but their ability to manage their internal structural dimensions, generally characterized by company’s organizational chart (Waterman et al., 1980). Thus, a superior IT support with incorrigible fitment into the organizational process components is viewed as a poor IS capability. Also, an ordinary IT support with perfect fitment into the organizational process components is a good IS capability though not an excellent one. However, the quality of IT support on process fitment dimensions of the organization is influence mainly by the financial spending towards IT support. In this context, the preliminary indicative mapping on growth stage of the organization in terms of IT spending can be made through the Nolan (1979) framework. However, the basic framework for carrying out the IS capability checking can be established through an organizational level planning tool in terms MIS framework proposed by Gorry and Scott Morton (1971), which is based on the federation of managerial activities in terms of three control components such as strategic planning, management control and operations control. Further, Scot-Morton (1991) provides IS capability basis for organizations’ in terms of the relationship (process components) that exist among the major organizational factors such as strategy, structure and skills. These theoretical framework can be deployed at practice in terms of analyzing the parameters such as

1. The real objective of deploying IS capacities for an organizations in holistic perspectives with the availability of budgetary provisions towards the IT spending.
2. The level of fitment existing among the existing processes and IT support.
3. The strength of the IT portfolio in the organization in terms of sufficient technical people towards managing and updating the IT infrastructure.
4. Ability of the organization towards tapping IT innovation in the existing process set with BPR (Business Process Re-engineering) possibilities.
Out of these four parameters, the first one is viewed as the function of factor organizational strategy. The second parameter is viewed as the function of structure and the third and fourth is the function of organizational skills.

Review of literature

The parameters that are considered relevant in checking the IS capabilities are the conceptual derivations based on the Scot-Morton (1991) framework which requires further introspection of the literature on major organizational variable such as strategy, structure and skills. Hence, to establish a theoretically grounded initial reference position the literature were identified and classified accordingly.

(i) Strategy

The fact that the term strategy emerged from the war science is an indicative reference towards generating competitive advantage in many dimensions including a major one like IS based competitive advantage generated through IT products. The possibility of creating a new IT products towards generating competitive advantage was well anticipated and reported in the works of Mckenny and Mcfarlan (1982) and Mcfarlan (1984), where imperatives could be noted on application integration and electronic systems. Further, Wilson (1989) reports that an information systems strategy brings together the business aims of the company, an understanding of the information needed to support those aims, and the implementation of computer systems to provide that information. In this context, it was noted that these works have highlighted these issues towards generating competitive advantage through the application of IT systems.

The importance of various activities sharing common information towards generating competitive advantage was conceptualized in Porter and Miller (1985) on the basis of supply chain functions of an organization. A framework towards establishing a link towards information system strategy and organization’s overall strategy could be noted in the work of Galliers (1993) that has its basis on major IS functions. The strategic imperatives of IS functions like Information strategy, IT strategy and change management strategy were viewed as the sub function of overall organizational strategy in the above work. In similar lines, the issue of operational excellence is given with less importance on porter’s (1996) work, which emphasized on the uniqueness of the activities that an enterprise chooses to differentiate from its competitors. Some of the implicit objectives the organization might choose to operate can have its basis generated through the above work.

(ii) Structure

This is nothing but the system of forces and the forms in organizations in terms of direction, efficiency, proficiency, innovation and concentration. According to Mintzberg (1991), the strategic directions of organizational structure are aided by the individual behavioral issues like cooperation and competition within an organization. The conceptual article of Ackoff (1967) emphasized the fact that the design of MIS should be compatible with the structure and process of the organization in which they are embedded. In this context, it’s observed that most of the computerized MIS installations fail to serve the purpose because of the erroneous assumptions underlying its design. A general scheme for relating systems to the jobs they are supposed to do was provided by Zani (1970) towards defining a framework for designing any system that could fulfill both its function and management expectations on the potentials of information systems at large. The significant contribution by Dearden (1972) provided the basis for separating different functional activities in the organizations based on the information needs. Concerns regarding mapping down the organizational functions towards creating single integrated computerized MIS could be noted through this work.

The pioneering work of Barros (1981) provided the complete framework for the MIS structure in terms of different types and integration possibilities in application software systems. In this regard, it’s highlighted that the MIS structure of the organization is the combination of various processes, information components and decisions. Thus, the strong basis for different types of MIS structures for similar organizations in terms of different functions and information flow could be noted through this work. While proposing the methodology for designing the MIS structure of larger systems, Gupta and Sushil (1993a; 1993b) proposed that it would be much easier to achieve a fit of MIS with the
organizational structure, if both are taken up for simultaneous design. Further, it’s highlighted that the design of structure or architecture aims to achieve fit between the form and the context that can provide holistic view of the system.

(iii) **Skill**

The firm’s ability to commercialize an innovation may require that its internal resources be utilized in conjunction with the complimentary resources of another firm. Complimentary resources endowments have been noted as key factor driving returns from alliances (Teece, 1987; Hamer, 1991; Hill and Hellriegel, 1994; Shaw et al., 1994). Further, Teece (1987) suggested that firm need to possess complementary assets to gain competitive advantage. In the context of the above studies, the complimentary assets are defined as the resources that are required to capture the benefits associated with a strategy based on technology or an innovation to gain competitive advantage in the market.

The major factor affecting the technology adoption of the enterprise is not the technical capabilities of the enterprises in line with the technology to be adopted. In this context, Lefebvre et al (1991) identified four categories of factors that can influence adoption of a new technology by SMEs such as characteristics of the firm, competitiveness and management strategies of the firm, influence of internal and external parties on the adoption decision process and the characteristics of new technology adopted. The role of chief executive of the enterprise in IT adoption process of the enterprise is viewed with higher level of significance. In this context, Thong and Yap (1995) observed that that the SME that is likely to adopt IT would most often have a chief executive who has a positive attitude towards the IT adoption. Further, it’s highlighted that the specific chief executive must be a person with innovative ideas aided by the knowledge about IT.

**Methodology**

This study focuses on understanding how IT support is aligned with the existing process set of the organization, which an institute of Higher Education is functioning in United Arab Emirates. Hence, data were collected from three sources such as analyzing the existing campus ERP (A proprietary application System deployed for internal operations of the Institute) for its functionalities, verifying the documents (organizational chart, IT manuals etc.) and recording human centric issues towards finding out the status of existing IT and the process alignments. In order to capture the human-centric issues, an interpretive perspective is adopted, which seeks human articulations of the world as individuals attempt to make sense of their surroundings and persuade others of their perspective. In doing so insight is gained into the 'interlocutors’ versions of a existing reality (Walsham, 1993). This epistemological position is aligned with constructivist studies because multiple interpretations, when combined together, highlight a web of socio-technical agency – an ensemble of interests – that is created and maintained over time (c.f. Orlikowski & Iacono, 2001). Intensive field research involving qualitative research methods facilitated this study of IT alignment into the existing process set. Data were collected by the primary author during multiple phases of field work between Jan 2011 and September 2011. As a full-time employee of Institute of Higher education, the researcher was well positioned to enter the field site with an informed understanding of cultural values and norms. This facilitated communication during the data collection phase through the appropriation of local language, symbols and practices. Gaining access to these individuals and garnering their trust was timely because the researchers were viewed as insiders. Thus, the researcher was quickly able to establish credibility and develop interpretations of context with greater depth than would likely have been the case in less familiar surroundings. Field data included 18 repeated interviews with 40 members of the institution who were directly involved in the system under study or IT product under creation. These individuals made up 80 percent of the total interviews conducted and Beneficiaries and the remaining 20 percent of interlocutors were not involved in any of the major aspect of the system under study. The majority of interviews were conducted based on the narrative interview (NI) convention (Bauer, 1996) where the interviewee is asked to discuss what happened during a particular timeframe and to raise issues that are important to them at the time without prompting from the researcher. Field notes were taken within a hardbound journal and complemented the interview transcripts by providing qualitative information that influenced the field researcher’s interpretation of
the interview content or the interviewee him/herself. Subsequent to exploratory interviews with members of the organization, the field researcher transcribed each interview and analyzed its content to identify key actors and related to ‘hot topics’ or controversial issues surrounding the real objective of the study.

Case description

The Institute of higher education that forms the basis for the present study was established in the year 1991 as Institute of professional development imparting career training on travel, tourism and hospitality Industries. With higher levels of employee attrition rates, the Institution could manage to grow into a full fledged Institute of higher learning offering BBA and MBA programs accredited by the ministry of Higher Education, UAE. The existing market situation comprising lack of competition and comparative quality offerings fueled the growth of this institution to its present level. During the study period this Institution had 700 students with an employee’s strength of 50 comprising 18 full time Faculty members. The exact organizational structure of the Institute can be traced from the organizational chart provided in the figure -1., where it could be noted that most of the academic support services are operated as separate unit under the president’s office with an Independent Institutional Research Office that has the major responsibility of assessing the efficiency of the faculty members on students feedback rating.

Figure 1 : Organizational structure of the Institute of Higher Education

Source: Faculty Manual of Institute of Higher Education, Academic Year 2008-09

(i)Information Technology (IT) adoption

In an effort to get the ministry approval for the programs, the Institute was forced to adopt IT actively into its operations ever since the year 2006. Thus, they could launch their own website serving the students and a campus ERP serving the Academic, Administrative and Examination operations. In addition to this all the functional units shown in the organizational chart were empowered with a PC or two running individual applications on personnel productivity suits like MS-Excel, Word and PowerPoint. Further, all these PCs except those serving the finance function were interconnected through campus network (LAN), enabling the end-users to accesses the office communication system configured through MS-Outlook express. In order to enable the finance division to accesses the internal e-mails and Internet, the division was provided with a PC connected in the campus network but physically well separated from the custom built applications running on a standalone system.
(ii) Details of IT infrastructure

Although IT usage existed in the organization previously, it was only confined to the finance division with rest of the functional units operated on established manual procedures. Because of the enhanced IT usage, a separate IT division comprising four full-time employees IT Head, Hardware Service Assistant, Programmer, and Server Administrator was established. This IS functional division manages all the IT operations including software development and service, hardware maintenance and service, networking, and help desk support. The details of the IT hardware and various applications operated on it can be observed from Table 1.

Table 1: Details of IT hardware and applications on functional divisions

<table>
<thead>
<tr>
<th>Functional Division</th>
<th>Applications Used</th>
<th>No of PCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Marketing and students registration</td>
<td>Spread Sheet &amp; Office Communication system</td>
<td>2</td>
</tr>
<tr>
<td>2. Students' Service Department</td>
<td>Spread Sheet &amp; Office Communication system</td>
<td>1</td>
</tr>
<tr>
<td>3. IS Department</td>
<td>Spread Sheet &amp; Office Communication system</td>
<td>2</td>
</tr>
<tr>
<td>4. Library operations</td>
<td>Spread Sheet &amp; Office Communication system</td>
<td>3</td>
</tr>
<tr>
<td>5. Human resource Mgt.</td>
<td>Spread Sheet &amp; Office Communication system</td>
<td>2</td>
</tr>
<tr>
<td>6. Sports &amp; health</td>
<td>Spread Sheet &amp; Office Communication system</td>
<td>1</td>
</tr>
<tr>
<td>7. Administration and examination</td>
<td>Spread Sheet, Office Communication system &amp; Campus ERP</td>
<td>4</td>
</tr>
<tr>
<td>8. Finance department</td>
<td>Spread Sheet &amp; Office Communication system</td>
<td>2</td>
</tr>
<tr>
<td>9. Institutional Research office</td>
<td>Spread Sheet &amp; Office Communication System</td>
<td>1</td>
</tr>
<tr>
<td>10. Faculty academic operation support</td>
<td>Campus ERP &amp; Office Communication system</td>
<td>25</td>
</tr>
<tr>
<td>11. Computer Lab (I,II,III) &amp; Class Rooms</td>
<td>Java &amp; MS-Office with Power point applications</td>
<td>130</td>
</tr>
<tr>
<td>12. WebServer &amp; Enterprise Server</td>
<td>Internet Information Server on Windows NT</td>
<td>2 (Servers)</td>
</tr>
<tr>
<td>13. Other operations</td>
<td>Spread Sheet &amp; Office Communication System</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>180</strong></td>
</tr>
</tbody>
</table>

Source: Collected from IS functional unit of the Institution Academic Year 2009-10

The software for managing the IS operation is deployed in three discrete applications with independent database schemes as shown in the figure-2. Further, the campus ERP which is a proprietary system supports 30 end-users with independent PCs, interconnected in the campus network excluded from the finance module. All the Faculty members, employees of the Administrative and Examination division are the active end-users for the campus ERP system. In addition to the end-user PCs, the campus network also interconnects some 120 PCs operating on various functional units and the labs. This arrangement is done mainly towards enabling IT infrastructure management that also acts as the channel for enabling Internet connectivity on specific end-user terminals.
Figure 2: Major Application system supporting IS operations

![Diagram of Major Applications]

Source: Model developed by examining the existed IS operations

(iii) Details of major application systems

The existing application systems deployed has three independent modules such as Website, the campus ERP and Finance module. Out of this three, the website is being hosted from Institute owned web server and it effectively serves the requirement of web presence for the Institute. In addition to the web presence, the web system deployed supports certain important operational and transactional utility for the students of the Institute. The campus ERP was developed in-house and deployed with functionalities built on Microsoft Based Visual Basics 6.0 tools. The finance operations are managed mostly with customized applications built on Spread Sheets through MS-Excel. The exact details of the functionalities that are supported through these three discrete applications with de-centralized database are provided in the table-2. In addition to these major application systems, effective utilization of spread sheet applications based on MS-Excel could be noted in the functional units like IS department, Institutional Research Office and Library of the Institute when compared with rest of the functional units provided in the organizational chart.

(iv) Problems encountered in IS operations

The problems that are encountered in the IS operations of the Institute can be classified into two major heads such as Technology-centric problems and Human-centric problems. As far as the technology centric problems are concerned, it is observed that they are more intense on all three major application systems deployed and the exact details are provided in table-3, where it could be noted that almost all major applications encounter some problems.
Table-2: The different functionalities supported by the IS applications

<table>
<thead>
<tr>
<th>Web System module</th>
<th>Finance Module</th>
<th>Campus ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attendance performance tracking by the students</td>
<td>1. Students Fees management</td>
<td>1. Students attendance management by the faculty members</td>
</tr>
<tr>
<td>2. Assessment performance tracking by the students</td>
<td>2. Salary and wage administration</td>
<td>2. Students Assessment management by the faculty members</td>
</tr>
<tr>
<td>4. Students’ Academic support services feedback system</td>
<td>4. Stationeries &amp; Inventory Management system</td>
<td>4. Students’ admission management system by Administration control.</td>
</tr>
<tr>
<td>5. Faculties’ Academic support services feedback system</td>
<td>5. Managing credit card operations</td>
<td>5. Students Assessments weight management by the Examination department.</td>
</tr>
<tr>
<td>6. Web based institutional mail access system</td>
<td>6. Managing other credit &amp; debit transactions</td>
<td>6. Students course credit management system by the examination department.</td>
</tr>
</tbody>
</table>

Source: Primary data collected through analysis of existed campus ERP application

Table-3: Problems observed on functionalities supported by the IS applications

<table>
<thead>
<tr>
<th>Web System module</th>
<th>Finance Module</th>
<th>Campus ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students report mismatch in original recorded attendance with the details tracked.</td>
<td>1. Most of the report on students fee payment issues are manually prepared with spread sheets causing delays.</td>
<td>1. Most of the faculty members are not comfortable with the GUI deployed in general.</td>
</tr>
<tr>
<td>2. There are some reports of mismatch in the original assessment and details tracked.</td>
<td>2. Pay bill cannot be generated instantaneously on the request of an employee.</td>
<td>2. Student details retrieval demands difficult navigation steps in the GUI.</td>
</tr>
<tr>
<td>3. Some faculty members suspect system’s reliability to collect and process the academic feedback.</td>
<td>3. Annual statement on the salary and gratuity details cannot be generated instantaneously on the request of an employee.</td>
<td>3. Inadequacy in the GUI causes certain manual operations in assessment calculations.</td>
</tr>
<tr>
<td>4. Attachments cannot be uploaded in the web access of institutional mail system.</td>
<td>4. Retrieval of specific financial transaction causes unacceptable delays.</td>
<td>4. Examination department often uses manual procedure to check the accuracy of credit scores.</td>
</tr>
<tr>
<td>5. Slow access speed of the website outside the institution premises.</td>
<td>5. Lack of structured format in managing other credits and debits often causes delay and confusion.</td>
<td>5. System is incapable of transferring the details of the newly admitted students into the attendance module in real time basis.</td>
</tr>
</tbody>
</table>

Source: Primary data collected through analysis of existed campus ERP application

In an effort to provide solutions to the technology centric problems cited, the Institution is making an effort to integrate the applications running on campus ERP with Web System module so far with least success. More importantly, the institution could not meet the deadline they have set forth for such integration.
(v) **Human-centric problems on IS operations**

Towards identifying the possible deadline for completion of tasks on technology centric problems, informal interviews with the concerned people were made as part of this study. It could be noted that the entire task is being carried out by the programmer in the IS functional unit, who is basically a good programmer with little knowledge on System Designing and Analysis Skills. Also, the existing ERP system was designed without a documented system design by adopting rapid application development method and the person who designed it has left the Institute before establishing present IS functional unit. Under these circumstances, the programmer is doing the job purely based on the GUI details of the existing ERP software. Since the programmer is not well versed in the academic operations of the Institute, the personnel is not in a comfort zone to understand the various process components associated with the existing campus ERP.

More importantly, the IS functional unit has so far not placed a request to appoint a System Analyst as some key personnel in the division has the fear of losing importance in top management. Also, the management of the Institute is not in a position to understand the requirement needed to complete the task in this regard. In an effort to find out the opinion of the top management on the slip of the deadline, it is observed that they are confident of managing the entire situation in their own way may be in conventional or in an unconventional manner. Further, the top management is very particular that they should not invest any thing more on software development initiative. Instead, they feel contented that IS functional unit is being managed with minimum possible cost heads.

As far as the issue of top management's importance towards a key person in IS functional unit is concerned, it is due to the service the personnel renders to fulfill the implicit objectives of the Institute. In an effort to find out the popularity of that key personnel, an informal interviews with IS end-users of the institution comprising the Faculty members, Members of Administrative and Examination division and other members of IS functional unit were conducted and opinion were collected. As far as the opinion of the members who are outside IS functional unit is concerned, they feel that the concerned person used to be very arrogant with non approachable characteristics. Also, many of them feel that their 3rd party e-mail accounts are often hacked and place this particular person responsible for it. More specifically, a Faculty member, who has resigned recently on the issue of low salary, strongly proves that his 3rd party e-mail account was hacked and certain important information regarding his future job assignment was provided to the top management of the Institute. Also, many members of the Institute are not happy about the fact that their office communication system is kept continuously under the scrutiny of top management. As far as the opinion of the other members of IS functional unit are concerned, they reported that the concerned person is sufficiently good in configuring the hardware with insufficient knowledge about software aspects. Also, they said that they have learnt to adjust with him as he is capable of protecting their interest when it comes to the issue of handling the top management. Thus, these problems point the initial reference position in terms of Information Systems capability checking towards organizational strategies.

(vi) **Case Analysis**

From the view point of organizational strategy based on IS capabilities, this is a typical case where a sufficient IT hardware infrastructure is being underutilized due to the inadequacies in the software deployed as the function of financial objectives of the organization. Also, the existing campus ERP has serious misalignment with the organizational structure and most of the applications operate in isolation either without or in a decentralized database schemes. Thus, interpolating possibilities of typical applications are limited causing the process mismatch. Also, the Institution in its present IS capabilities cannot look forward towards radical change in there IS operations as they lack the will and skill to collect relevant information, process it and create a software needed. This kind of organizational proposition is substantiated by the following points of Analysis.

1. The present system serves the real objective of the Institute which is more implicit in nature than being explicit. The major explicit objective of getting the approval from Ministry of Higher education has already been achieved through the present IS capability. The remaining explicit objective of deploying IT to gain competitive advantage in terms of
operational excellence has been placed next in priority to the implicit objectives like cost minimization, information infringement and the retention of cheap labor, Institute often manages to recruit.

2. Based on the problems reported from students operational utilities in the web system module, the inadequacy in IT support to process components of attendance entry and attendance retrieval can be ensured. This problem persists because attendance entry by the faculty members and the student's attendance retrieval schemes do not share a common database. This is also a case with respect to the students’ assessment entry by the faculties and its retrieval scheme by the students. This problem can be solved only by integrating the concerned applications.

3. As far as the problem of Faculty members suspecting their feedback system is concerned, it has some basis as the feedback data collected from the web system module is transported to the institutional research office through a temporary storage medium by IS functional unit. During the process of data extraction and transportation, possibilities of data distortion exist in the present system. This kind of problems can be solved only by creating an application which can directly upload the data into the functional utility of Institutional Research Office. Hence, this is also an instance where inadequacy in IT support to the existing process component can be noted.

4. The problem of slow access speed of the Institutional website is mainly due to the inability to ensure a perfect configuration of the web server and mail server operated in the Institution. The existing technical crew in the IS functional unit is incapable of doing this task, so much so with the problems associated with attachment options in the mail systems.

5. Inability to generate instantaneous reports on various financial transactions in the finance module deployed is an instance where poor software support is given to the process components of finance operations. The fact that finance division is managed by spreadsheet application is an ample proof for this. The solution to this problem can be provided only when the Institution adopts certain sophisticated third party accounts suits by spending extra money.

6. The problem of difficult navigation schemes in the GUI with inadequacies on the existing campus ERP is due to the poor design chosen by the previous developer. However, this issue is an indicator of lack of organizational skill towards providing sufficient training to the new Faculty members in terms using existing ERP and assessment calculations.

7. The problem of attendance sheet update for newly admitted students has its basis in the organizational structure adopted. The function of students' registration and admission is handled in the marketing division which operates in isolation from the Administration division. This kind of organizational structure critically requires the applications in both the division to be integrated sharing the common database towards process re-engineering. However, even with the usage of present ERP, this problem can be solved if the process of students' registration is transferred to administration division.

Conclusion and implications
The better utilization of IS to implement organizational strategy is a function of good IT team comprising hardware, software, database, networking and system designing professionals. This can be ensured only if the top management of any organization is sufficiently knowledgeable in demarking these differences in IT products. Further, such organizations should realize that seldom they can come across a person who can be competent in handling all IT products. Any insufficiencies in this regard have to be handled with a consultant of relevant experience even if it's a matter of spending extra
money. The concept of cheap labor in this kind of scenario will result in unnecessary organizational politics and even in legal mitigations in the long run. Further, the organizations adopting IT with an implicit objective of information infringement should have legal consultant on the acts of information privacy norms, adaptable in a particular socio-political environment. Of course such organizations have to pay for these services though not in the immediate context but in the long run.

References


