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Organisation Preparedness and Information Technology Acquisition Success: An Assessment Model

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ABSTRACT

Business processes have been exploiting the continual growth of information technology, and therefore, with complexity. Without adequate IT support, an organization can hardly survive these days. IT acquisition involves two important process dimensions, one, suppliers' capability to adequately evaluate the IT needs of the organization and two, users' capability to properly assess its own IT requirements. Due to mismatch in the understanding of the IT dimension by business process owners and business dimension by IT managers, IT acquisition in many cases result in failures. User's involvement may help an organisation to prevent post acquisition shocks. This paper first discusses users, IT acquisition process and its phases. It further discusses a model to ascertain organisation's preparedness based on preparedness of Users, information system, technology in the pre-IT acquisition process. Through this case based research, the model is tested to examine the role of organisational preparedness to predict the health of the future IT acquisition.

Keywords

Business Processes; IT Acquisition; User role in IT planning; Capability of IT providers.

INTRODUCTION

Responsiveness and flexibility are the key performance areas for success of any organisation since modern business processes have become very complex today (Gebauer, 1997). IT plays an important role in supporting this agility to the organisation and increase productivity (Lee, 2001). But IT has remained a black box for the organisation which is otherwise well understood by the IT planners, service providers. Despite this limited access to the black box, IT is fast gaining the status of infrastructure in most of the organisations because of its capability to handle huge information and provide automated and improved process environment (Broadbent, Weill and Tim., 1996). IT as an infrastructure has many hard components. But the critical factor remains to be dealt with caution is the soft issues involving identification of need specific infrastructure and the overall skill to own and manage the acquired technology (Herron 2002). Despite the technological advancements and ease of use, organisations fail to leverage the usefulness of IT infrastructure and there are many failure stories. Studies (Lycett, Macredie, Patel and Paul, 2003) reveal that 80 to 90 percent of software does not meet performance goals, 80 percent of them are delivered late and over budget, 40 percent of developments fail or abandoned, less than 25 percent of systems properly integrate business and technology objectives, and only 10 to 20 percent meet their success criteria. The purpose of the study is three fold. One, the attributes to failure or success of IT acquisition needs to be

understood. Second, role of the user in IT-acquisition process need to be explored. Third, the preparedness of a user needs to be assessed for the IT-acquisition process and its impact on the success of such IT-acquisition needs to be measured. Three case studies are taken up to address these issues through primary survey in the select organisations.

PREPAREDNESS AND IT-ACQUISITION PROCESS

Most of the software engineering methodologies provide scope for project management tools that could be used by an organisation. Figure 1 suggests that in an acquisition process role of organisation and supplier is quite specific (Misra, Satpathy and Mohanty, 2003). Various quality models ensure the acquiring organisation to measure the capability of a supplier. Popular among these are CMM, ISO-9000, SPICE etc. (Sheard, 1997; Ryan and Al-Qaimari; Jokela and Pirkola, 1999; Jokela, 2002; IEEE, 1994; Jalote, 2002; ISO, 1995). A user is broad representation of the stakeholders in IT acquisition process. A buyer, a supplier, a technology provider provide user profiles with different objectives. In an acquisition process, user's role is quite wide spread. An end-user in the process could be broadly defined as all those stakeholders in the process such as the users in the organisation (the acquirer) through the functional and operational end-users who ultimately use the technology acquired. Suppliers of the IT might involve in-house IT developers/ Outside IT vendors, but their roles are limited to using the tools and technologies and therefore, are the intermediate users. All of them use IT for a common cause related to the success of the acquiring organisation. An end-user therefore, forms all these users.

Figure 1 (vide appendix A) suggests that user (buyer) should be capable of assessing the supplier/ vendor/ technology provider, own employees and should also be able to stipulate individual as well organisation's need and models do exist to understand the supplier. Similar should be the case for the supplier who should be capable enough to understand the buyer. Unfortunately there is no model that ensures the preparedness of the buyer and the supplier prior to initiation of acquisition. System development life cycle (SDLC) and various process models like spiral, waterfall etc. (Pressman, 1997) do provide a scope for the user-buyer relationship that ensures some knowledge for the supplier to understand the organisation (Mantel and Teorey, 1989). But these are during the process of acquisition and software project centric. Among various models, the most relevant we discuss here is the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, Davis, 2003). It is based on Technology Acceptance Model (TAM and TAM2) (Davis, 1989). UTAUT provides a base for the managers to assess the likelihood of success for new technology adoption and helps them understand the drivers of acceptance. The key determinants are "user's intention to use" and "usage behaviour". This model extensively organises user expectations, but is limited to the software-centric efforts. There are certain attempts to understand the organisation's capabilities as well. A model (Weil and Olson, 1989) testifies the concept of identifying variables (strategy, structure, size, environment, technology, task and individual characteristics) which have a link with performance and success of organisational fit. It is therefore; quite essential to understand the organisational need before embarking on IT adopting process and the project should not be skewed to application software. This dependency would provide better results in IS-IT alignment because of establishment of a greater coherence (Wang and Tai, 2003).

PROPOSED MODEL

The issues emerging from the models discussed so far are focussed on user preparedness that would facilitate in acquiring a sustainable IT infrastructure (better life cycle) (Irani, 2002). Preparedness of the organisation as a whole is an important step in the pre-IT acquisition scenario and should be taken up much before IT acquisition starts. Proposed model as shown in figure 2 is based on this concept. This model builds on the issues related to assessing user's capability, IS preparedness, technology preparedness which in turn assesses organisational preparedness. The model depends on the concept that an organisation needs to understand the culture of the organisation, users (employee as well as management) aptitude and attitude towards IT acceptance, the change management issues involved for the user to accept a technology as a first step. Organisation preparedness (Woodroof, 2003; Umanath, 2003; Luftman, 2003; Moody, 2003) would depend on these two aspects of pre-acquisition preparedness and climate preparedness. The next step that the organisation needs to follow is to understand the technology acquisition process. This is intended to assess supplier's capability to understand buyer's business process and user's capability to manage monitor the project to have the organisational fit. With these processes managed, the outcome would be assessed in the end (rather the first as well!) to understand how well the acquisition has been managed.

Explanation of the Model

The model as discussed above intends to be used as a tool for the strategic user to understand its organisational preparedness while exploring the possibility of having a successful IT acquisition. It would also help the strategic user to perpetually assess

the extent of success the IT acquisition in the organisation and trace through the reasons thereof. The model has many components named as constructs as shown in figure 2 (vide appendix A) and explanation of each component is provided below:

User Preparedness (U)

Apart from various models like that of TAM, UTAUT; DeLone and McLean (Rai, Lang, Welker, 2002) model also provides insight to the role of user in making the system successful. However, role of a user depends on its position in its hierarchy in the organisation and the decision making process (i.e. operational, tactical and strategic users), since degree of preparedness is dependent on the layer in which the user operates in. A layer wise link among these layer and suitably interfacing with IS strategy would be a good strategy for preparedness (Watson, Leyland, Kvan, 1988). These are explained in Table 1 (vide appendix-A).

IS Preparedness (I)

IS preparedness has been seen as a relation to organisation's preparedness to harness IT. IS is an important component of the organisations environment (Bakopoulos, 1985) for building interfaces (Seddon, Staples, Patnayakuni, Bowtell, 1999; Earl, 1993), integration (Braodbent et al., 1996). It is experienced that strong orientation of IS towards business processes rather than becoming IT centric would provide better results and use of IT artefacts (Alter, 2003). IS preparedness (I) is proposed to understand existence of any strategy for establishing systems orientation to information (Watson et al., 1988), a MIS framework for successful transactions (Abdulla, Kozar, 1995; Lamb and Kling, 2003; Seagars and Grover, 1998; Lee, Kozar and Larsen, 2003).

Technology Preparedness (T)

This component would assess organisation's strategy to organise IT and strategic IS management to carry out the acquisition process (Broadbet and Weill, 1996). Drawing up the "Business maxim" and "deriving the IT maxim" are the major deliverables of an acquiring organisation in the pre-IT acquisition scenario. IT comes with relevant components (networks, databases, applications and expertise etc.) and a strategy must be formulated for acquisition each component in order to provide a better alignment strategy to the IS (Huang and Hu, 2004). Effecting control over the IS driven IT infrastructure for meeting the business needs perpetually is an indicator of IS preparedness (Datnthanam and Hortono, 2003, Lamb and Kling, 2003, Jokela, 2001).

Pre-Acquisition Preparedness (P)

This preparedness is an aggregation of user preparedness (U), IS preparedness (I) and technology preparedness (T) of organisation in the IT acquisition process. Success in having the preparedness depends on organisation's inclination to conduct this exercise, preparing its stakeholders to organise themselves for the technology adoption. This preparedness would lead to better systems usage, effective transactions and sustainable interface among the processes even if IT is acquired. Ownership of the IS would emerge because of this effort and facilitate to understand the thrust areas of IT adoption.

Climate Preparedness (C)

Here model tries to recognise the importance of the organisational climate that affects the IT-acquisition process. User' perception on the organisation especially that of strategic users knowledge on decision making process, architecture of the organisation, support from all other users is captured. Besides, users' knowledge at tactical and operational levels on the process and attitude of these users towards IT are measured. It is often found that managers and professional workers are averse to IT because of fear and anxiety due to this new technology (Grover, Teng, Fielder, 2003; Yaverbaum, 1988, Karahanna, Straub, Chervany, 1999).

Organisational Preparedness (O)

This preparedness is a measure of overall preparedness in pre-IT acquisition scenario. It depends on the tasks (assessing P and C) the organisation has well performed. The rationale behind assessment of this preparedness is to involve all the

stakeholders of the process to involve themselves in the exercise and make an informed decision on the technology they would own on a sustainable basis (Seagars and Grover, 1998, Earl, 1993, Abrahamsson and Jokela, 2000). If this preparedness is not aimed at, IT acquisition would take place based on the mere perceptions and “faith” in the vendors with a gut-feeling (Huang and Hu, 2004).

IT Acquisition Process (A)

In today’s environment, diffusion of IT has been pervasive, though it is difficult to measure its effectiveness. It is therefore, essential to understand the acquisition process in an organisation and usefulness of the acquired IT assets. The model tries to capture the role of users in the acquisition process, its involvement in evaluation, monitoring IT projects and vendors’ understanding on the business processes. The project becomes successful with a strategic approach to acquisition of hard and soft assets in totality. The ultimate responsibility lies with organisation to oversee even if the project or even the IT enabled services are outsourced, since total cost of ownership is borne by the ultimate user-organisation.

Output of the Model (G)

The model while attempting to address the research questions projected, would examine the outcome of the IT acquisition process adopted by an organisation. The indicators are based on some success attributes that has been mostly organisation centric and have relevance to the success of an information system as well. The indicators are Successful IT acquisition in an organisation (SA), Life cycle of the information system and process improvement effort (LL), Success of IS-IT alignment (AL), and perception on user satisfaction (US). Output though is a measure that would be used by a strategic decision maker, its formulation depends on the three layers of users the organisational hierarchy (strategic, tactical and operational) (Watson et al, 1988). This output of the model can be used for backward traceability to understand the IT-acquisition process and its alignment status.

RESEARCH DESIGN AND SURVEY

Dependency of the items in the model is the centre of the study. Drilling down and tracing through the attributes of success and/or failure of the IT acquisition process are the applicability of this model.

Case Based Survey and Validity Assessment

Three cases have been taken to test the model developed. The cases chosen initially belong to manufacturing, utility and development sector. The main idea behind the selection process is to provide heterogeneity to the application of the model and assessing the validity. Besides, case based approach is adopted in order to facilitate an in-depth study of the organisation, capture the climatic understanding at all levels and users’ involvement in the IT acquisition process. Case based approach provides a powerful way to capture and appreciate problems (Aamodt and Plaza, 1994). Number of pilot cases studied is one in manufacturing sector, one in utility sector and one in development sector as shown in table 2 (vide appendix-A).

The pilot cases provide opportunity for application of the model to understand the preparedness of the organisation (one in number) where IT acquisition is in progress as well as determine the extent of success in the organisation (two in number) where IT already exists.

Instrument Administration

The model demands an in depth study on the Organisation. Therefore, we have adopted a strategy to stay in those organisations and have an intimate study on the organisation behaviour, its policy framework and decision making process along with the role played by each layer in the hierarchy. IT management personnel were also included in the sample across all these layers in order to understand the alignment issues. Researchers have spent on an average of 15 days in each organisation. In the process, questionnaires were administered to all the strategic users and sample tactical and operational users through different and focussed items. Since the study was made with physical presence, the response collected was 100 percent. Table 3 (vide appendix-A) shows the sample size and spread of the samples.

Each set of questionnaire has been designed to record responses in a “**Likert scale**” with range 1-7. (1: Strongly disagree, 2: Disagree, 3: Somewhat Disagree, 4: Cannot Say, 5: Somewhat Agree, 6: Agree, 7: Strongly Agree). The scores obtained are aggregated as such respondent wise and then mean score is found out for each construct. Over all score is then rated in the range as follows: 1-3: Moderately Successful, 4-5: Successful, 6-7: Highly Successful. The results are in tables 4 and 5 in Appendix-A. Table-3 explains about the preparedness of the organisation in its pre-acquisition scenario and provides a scope to trace through the preparedness. Table-5 provides a methodology to trace the preparedness of the organisation and IT acquisition scenario and a scope to trace back to understand the core issues that might have become a determinant to the success or failure of the IT acquired. Scoring pattern though might be organisation specific and a consensus needs to evolve for that organisation (Luftman, 2003), we have taken the score 5 in the 7-point Likert scale to be reasonable limitation for establishing the item to be worthy of it, based on the experts views for accepting this as a success measure.

Score card, Survey Results and Discussion

Survey results show that Utility organisation is successful in strategising IT acquisition, but there is a lot that can be done for having an interface strategy. Most of the applications are disjoint though transactions for billing as well financial accounting systems are on line. MIS is not properly delivered due to lack of the interfacing strategy. IS preparedness is also low having a poor score of 3.7 (table 4 vide appendix A). Though there is a MIS plan, the strategy for implementation is missing. User preparedness is also low as observed in the organisation and the score is 3.9. In this organisation, chaos still persists because of its recent reorganisation and transition from government control to becoming a limited PSU. Users are averse to this change and same is reflected at all levels. Strategic and tactical users are much process oriented, but system orientation lacks because of poor interface strategy. Technology preparedness is quite good, but within a system. The technology ownership is high since the CIO is from the industry and tools acquired are as per his choice. Acquisition process is also sustainable since the architecture chosen (centralised) is in consonance with that of the organisation (centralised). The vendor involved in supplying the infrastructure is unable to provide services as required, but the quality of installation is high. User’s capability is good because of the CIO’s expertise. The organisation is therefore, does not have any regret in IT acquisition and the score is around 5.4 (table 4). But one area of concern is the short life cycles of the information systems which are happening because of frequent reorganisation of processes. IS-IT alignment therefore, is not in a good state. Similar is the case with user satisfaction and it confirms the TAM model.

As regards the manufacturing organisation, the overall scenario is not encouraging. Presence of IT is quite high, but none of the four indicators in table 1 (User preparedness, IS preparedness, Technology preparedness, and IT acquisition preparedness) is noteworthy. The organisation has a MIS plan (IS strategy score 3.6), but is not followed professionally. Strategic user’s preparedness is very low (score 1.7), which is the main cause of concern. Process ownership in the organisation at tactical level is quite good (score 4.7) and process maturity and ownership exists. Operational users are quite good as well in terms of delivery and commitment (score 4.8). Despite having an MIS plan, the interface strategy is quite low (score 1.5) and transactions are still not on-line. Most of the IT enabled IS are disjoint. Architecture of the organisation is centralised and everybody has well understood the process (score 4.2). But architecture of IS and IT are not in line with the architecture of organisation since its reporting structure is yet to be stabilised. This is because of poor involvement of strategic decision makers. In table 4 it is seen that though IT acquisition is successful, lifecycle of IT enabled IS is very short and there are many patch works for each of the IS resulting in to rework and unnecessary expenses and user frustration (user satisfaction score is 3.5).

For the development organisation, all is not very well. All the indicators in table 5 (vide appendix A) score very less in the scale. IS preparedness is the least in the score (2.0). But there exists IT acquisition attempts (2.7). A volunteer consultant engaged has tried to bring in standard Microsoft product based IT components (score 2.5) and there is no MIS plan. Interface strategy for IS (score 1.4) and UT (score 1.4) is existing in its lowest form. Strategic users are away from the IS strategy and have left it to the consultant (score 2.9). The overall score is 2.9 and any IT acquisition would not bear fruit unless some corrective measures are taken though IT acquisition success is perceived (score 3.1, table 5). IS –IT alignment is not successful so far (score 1.7) and life cycle IT enabled IS is also poor (score 2.3). User satisfaction is moderate (score 3.2). In reality the situation is mostly in agreement with the scores obtained and interpretations made.

Limitations of the study and scope for further research

The study is limited to only three organisations though from different sectors. The idea was to test the model for its applicability across heterogeneous organisations. Likert scale is used for understanding the scope of using the model, but validation of this model needs large samples and use of instruments rigorously such as multivariate analyses etc., which will be taken up in the next phase of research. Since the use of the model is oriented for the strategic user, it provides scope for understanding the role of these category users in greater details for refinement of the model.

CONCLUSION

This paper attempts to explain the need of preparedness to understand the technology, understand own need from buyer's point of view and aligning these two needs for a successful and sustainable acquisition. It suggests a model for the purpose of enabling the buyer to involve itself in the pre-acquisition process and assess its preparedness for such acquisition. The model is also applied for examining the status of acquisition if already done. Since the scores obtained in these three cases are confirming to the real situations in the organisations as observed by the researchers, it confirms the validity of the model and the relationships of organisation's preparedness and success of IT acquisition. Backward traceability also confirms the situation of IT acquisition in the organisation and provides scope for validation of the use of the model.

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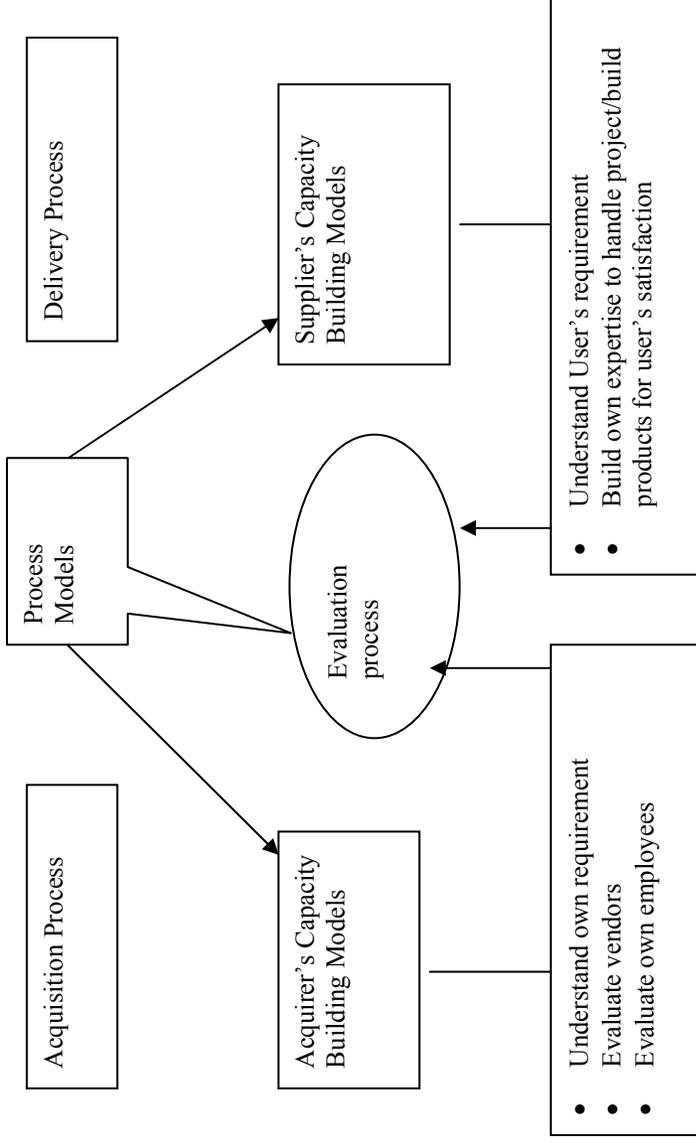


Figure 1: User's Acquisition Model

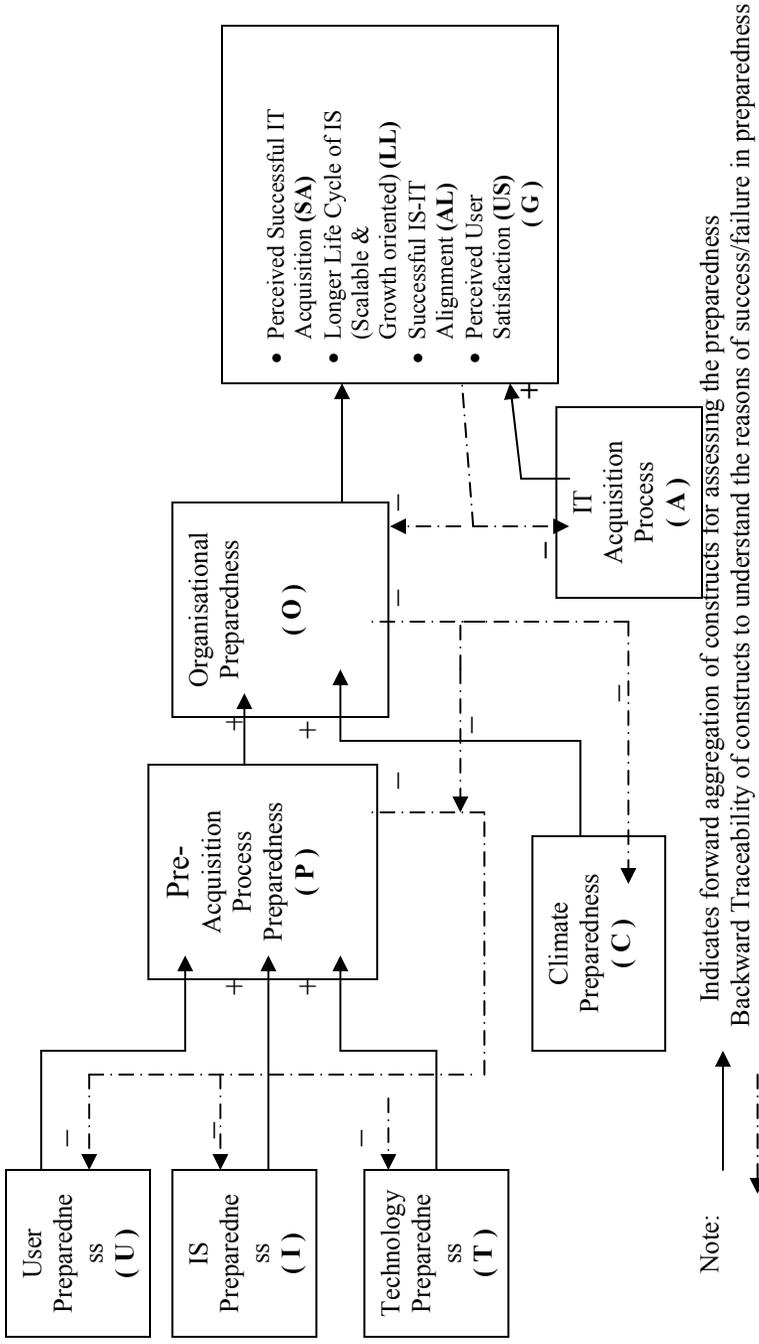


Figure 2: The Proposed Model

| IT-Acquisition Scenario in the Organisation | Aggregated Variable of Organisation | Attributes of Organisation Variables | Components of Organisation Preparedness Variable | Component Identification | Items |
|---|--|--------------------------------------|--|---------------------------------|---------------------------------|
| Effectiveness of the IT-Acquisition (G) | Organisational Preparedness For IT Acquisition process (O) | Pre-Acquisition Process (P) | User Preparedness | U | Strategic User |
| | | | IS Preparedness | I | Functional User |
| | | | Technology Preparedness | T | Operational User |
| | | | Climate Preparedness (C) | | IS Strategy |
| | | | | | Interface Strategy |
| | | | | | Transaction Strategy |
| | IT-Acquisition Process (A) | | | IT Strategy | User Perception on Organisation |
| | | | | Component Strategy | User Perception on IT |
| | | | | Interface Strategy | Architecture of organisation |
| | | | | User Perception on Organisation | Architecture of IS |
| | | | | User Perception on IT | Architecture of IT |
| | | | | Architecture of organisation | Vendor Capability |
| | | | | Architecture of IS | |

Table 1: Construction of Organisational Preparedness Matrix

| Sl. No. | Type Of Organisation | Core Activity | Status of IT Acquisition |
|---------|----------------------|--|---|
| 1 | Manufacturing | Manufacture and marketing of CEMENT | IT acquisition since 1988. Business process automation exists |
| 2 | Utility | Purchase, load despatch and grid management of power and supply to power distribution companies | IT acquisition since 1997. Business process automation in progress. |
| 3 | Development | Rural development interventions through health, education, women empowerment and creating village institutions | IT acquisition since 1990. Some process improvement steps are taken. Consultant is engaged for application development. |

Table 2: Organisation considered for pilot study

| Sl. No. | Type of Organisation | Sample Respondents (Users) | | | | |
|---------|----------------------|----------------------------|-----------|----------|-------------|-------|
| | | Type | Strategic | Tactical | Operational | Total |
| 1 | Manufacturing (1) | Non-IT | 2 | 8 | 15 | 25 |
| | | IT | 1 | 2 | 5 | 8 |
| 2 | Utility (1) | Non-IT | 1 | 5 | 15 | 21 |
| | | IT | 1 | 1 | 4 | 6 |
| 4 | Development (1) | Non-IT | 2 | 4 | 15 | 21 |
| | | IT | - | 2 | 4 | 6 |
| Total | | | 7 | 22 | 58 | 87 |

Table 3: Sample of Respondents

| Sl. No. | Constructs* | Components (Type/ (Sample size) **) | Sample Component Mean Scores (Sector) | | | Sample Construct Mean Score (Sector) | | |
|------------------------------|-----------------------------|-------------------------------------|---------------------------------------|---------|-------------|--------------------------------------|------------|-------------|
| | | | Manufacturing | Utility | Development | Manufacturing | Utility | Development |
| 1 | User Preparedness (U) | Strategic User(U1) | 1.7 | 3.7 | 2.2 | 3.7 | 3.9 | 2.9 |
| | | Tactical User (U2) | 4.7 | 4.6 | 3.5 | | | |
| | | Operational User (U3) | 4.8 | 3.4 | 3.2 | | | |
| 2 | IS Preparedness (I) | IS Strategy (I1) | 3.6 | 4 | 1.5 | 2.9 | 3.7 | 2.0 |
| | | Interface Strategy(I2) | 1.5 | 2.6 | 1.4 | | | |
| | | Transaction Strategy (I3) | 3.8 | 4.7 | 3.2 | | | |
| 3 | Technology Preparedness (T) | IT Strategy (T1) | 4.7 | 4.2 | 2.4 | 3.1 | 4.7 | 2.1 |
| | | Component Strategy (T2) | 2.5 | 4.6 | 2.5 | | | |
| | | Interface Strategy (T3) | 2.3 | 5.3 | 1.4 | | | |
| 4 | IT-Acquisition Process (A) | Architecture of Organisation (AO) | 4.2 | 3.6 | 4.6 | 2.6 | 4.6 | 2.7 |
| | | Architecture of IS (AI) | 3.9 | 4.8 | 2.2 | | | |
| | | Architecture of IT (AT) | 3.1 | 5.2 | 3.6 | | | |
| | | Vendor capability (VC) | 3.7 | 4.8 | 3.9 | | | |
| | | User Capability (OC) | 2.5 | 4.6 | 3.4 | | | |
| Over All Score (Mean) | | | | | | 3 | 4.2 | 2.4 |

Table 4: Forward Traceability Score Card

* Dependent Variables, ** Dependent variables (Questionnaire contains 77 different independent items to measure these variables)

| Sl. No. | Constructs | Components (Type) | Sample Component Mean Scores (Sector) | | |
|---------------------------|--|--|---------------------------------------|------------|-------------|
| | | | Manufacturing | Utility | Development |
| 1 | IT-Acquisition Quality Attributes (G) (Overall Assessment) | Successful IT Acquisition (SA) Life Cycle of IS (LL) Successful IS-IT Alignment (AT) User Satisfaction (US) | 4.3 | 5.4 | 3.1 |
| | | | 2.7 | 3.2 | 2.3 |
| | | | 3.2 | 4.2 | 1.7 |
| | | | 3.5 | 3.8 | 3.2 |
| Overall Assessment | | | 3.9 | 4.1 | 2.6 |

Table 5: Over all Assessment Score Card (Backward Traceability)