

Review

Measuring readiness for successful information technology/information system (IT/IS) project implementation: A conceptual model

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Many investigation have shown that the introduction of new investment in information technology/information system (IT/IS) are profoundly affecting the processes, work environment, structures and strategies of an organization. This is due to the fact that new IT/IS will lies in changing the people system or better known as 'soft issue'. The resistance to change might occur due to lack of creating a sense of need and urgency for change among the employee and consequently might lead to the IT/IS project failure. Therefore, to reduce the resistance to change among the employee, it is essential that an organisation needs to determine the level of readiness for change prior the introduction of new IT/IS implementation by measuring its internal capabilities. A failure to assess organisational readiness prior the IT/IS implementation may result in mangers spending more time dealing with the resistance to change or even worst may result in IT/IS failure. To date most of the traditional IT/IS performance measures are based on productivity and process, which focus mainly on method of investment appraisal and become obsolete and suffered with a many problem. Furthermore, majority of current IT/IS performance measure approaches are mainly post-investment measures which fail to address the readiness issues. On top of that, there are constantly lacks of understanding of the human and organisational issue in the current IT/IS measurement approaches. Those approaches also lack holistic perspective on IT/IS which unable to describe the complex impacts within organizations. Therefore, this paper will address the issue of organisation readiness prior IT/IS implementation. A proposed IT/IS maturity model is developed as an attempt to address the problem issues with current IT/IS measurement approaches. This model has been designed to measure the capability of organisation to "successfully implement IT systems" and it is applicable across industries. The idea is to provide managers with measurement tools to enable them to identify where improvements are required within their organisation and to indicate their readiness prior to IT investment. This model investigates four organisational key elements: IT, environment, process and people, and is composed of six progressive stages of maturity that a company can achieve its IT/IS capabilities.

Key words: IT/IS evaluation, readiness, information technology, information system, maturity model, success.

INTRODUCTION

The past decade has seen a rapid development of information technology/ information system (IT/IS) to facilitate business changes in many industries (Clegg et al., 1997; Smithson and Hirschheim, 1998; Serafeimidis and

Smithson, 2003; Hussien and Selamat,2005). Avgerou (2000) defined IT/IS role in organisational changes as an "enabler" of organisational objectives. Undoubtedly, IT/IS is well known as a tool to enable organisation to quickly respond to market changes and therefore, improve product/service quality (Porter and Millar, 1985). IT/IS is also recognised as a powerful agent for social and economic change (Chan, 2000). In their study, Graeser

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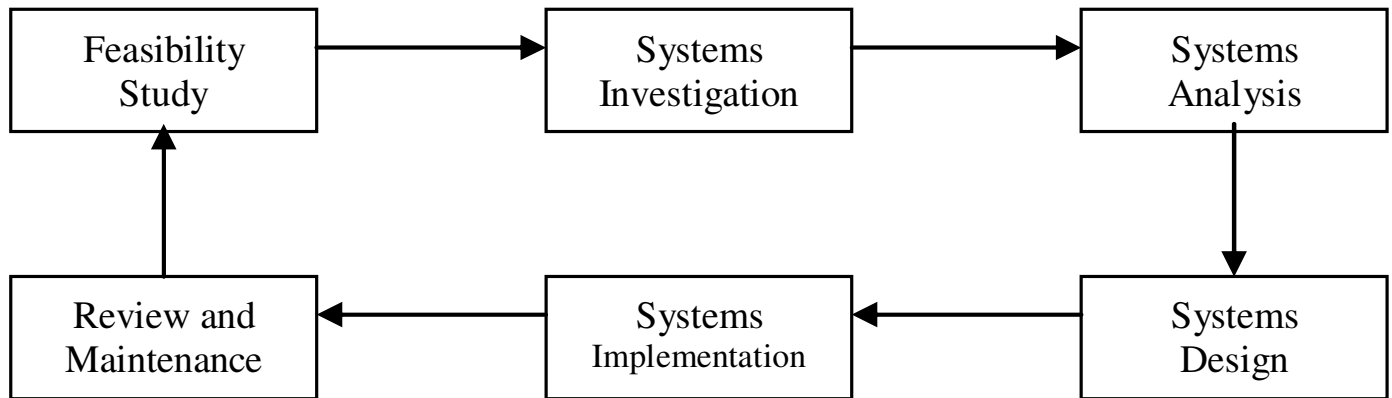


Figure 1. Conventional systems analysis – the systems development life cycle.

et al. (1998) expected, in some organisations, the investments may exceed 50% of annual capital investment and it has been suggested that, by 2010, the average IT expenditure will be 5% of revenue. A year later in 1999, Remenyi and Smith (1999) claims that more than 50% of all business investment is spent on IT/IS. According to May (2001) it is expected that the average fortune 200 firm will spend 20 - 40% of its operating budget on IT/IS just to stay competitive. In 2008, organizations continue to increase spending on information technology (IT) and their budgets continue to rise, even in the face of potential economic downturns (Kanaracus 2008; Petter et al., 2008)

Despite the huge spending costs for IT/IS investment, the failure rate is also increasing. Estimates of the level of failure may vary, but over the past 30 years they have tended to stay uncomfortably high (Ashurst and Doherty et al., 2008). Study by the Standish Group (1999), incorporated data from several thousand IT/IS projects, revealed that only 26% of those projects finished on time and within estimated budget. Furthermore, 28% were terminated before they were finished, while the remaining 46% involved costs higher than the original estimates and were completed behind schedule. Such statistics, along with the high investment figures, have raised serious concerns regarding the successful implementation of IT/IS projects.

Thus, the high percentage of IT/IS projects failures have led to wide investigative efforts over the years which are widely reported in the literature (Clegg et al., 1997; Lientz and Larson, 2004; Xia and Lee, 2005). Lyytinen and Hirschheim (1987) define IT/IS failure "as the complete abandonment of all development, maintenance of the implemented IT/IS." Researchers suggest that many IT/IS projects fail to deliver what is expected because organizations focus on implementing the technology rather than tracking and measuring the performance of IT/IS projects (Standing, Guilfoyle et al., 2006; Lin and Pervan et al., 2007). Several studies have revealed

that the probable causes of IT/IS failures are due to a lack of attention to organisational readiness. The inability to assess organisational readiness to successfully embrace new systems into their work environments may result in wasting time and resources by dealing with the resistance to change, or even worse may lead to IT/IS failure (Smith, 2005).

TRADITIONAL IT/IS DEVELOPMENT METHODOLOGY (ISDM)

The development of IT/IS during 1980s involves a number of phases as shown in Figure 1 (Avison, 1992; Avison and Shah, 1997; Maguire, 2000). This type of approach have been grouped under the heading of "hard systems methodologies" and has proved popular with IT/IS professionals since it caters for their needs as technical staff who view information system development as systematic problem-solving (Checkland and Howell, 1998; Maguire, 2000).

However, this IT/IS methodology suffered several criticisms from many authors. The majority of IT/IS development have been developed using a predominantly technical perspective and insufficient attention given to the social and contextual aspects of IS development (Avison and Wood-Harper, 1990; Avison et al., 1998; Maguire, 2000). Another view by Avison (1992) claims, such methodology faces many problems such as failure to meet the needs of business, inflexibility, user dissatisfaction etc. By the early 1990s, this approach was no longer sustainable as the managers started to realize that the IT/IS evaluation should be based on business results rather than technical performance (Serafeimidis and Smithson, 2003) (Figure 2).

Apart from being heavily criticized because of the lack of soft issues being addressed (Avison and Wood-Harper, 1990; Avison et al., 1998; Maguire, 2000), both of the system developments of the 80s and 90s also appear

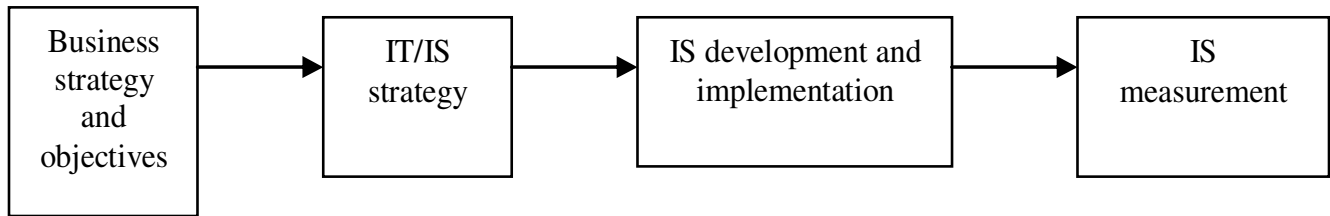


Figure 2. The systems development life cycle – early 1990.

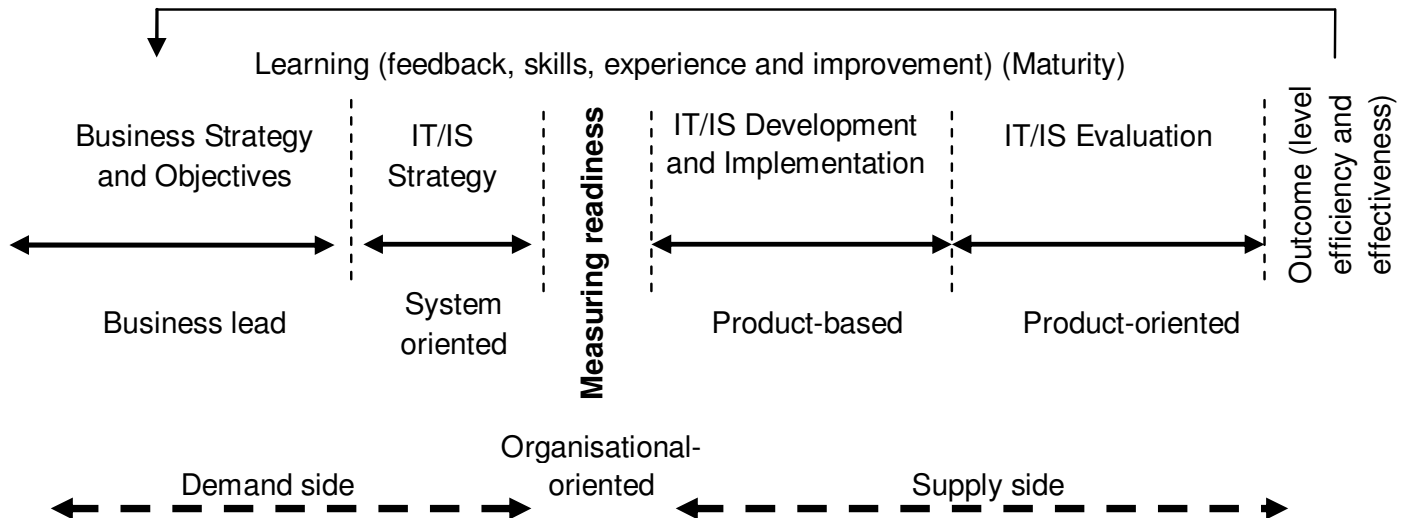


Figure 3. The integrated evaluation approach in system development life-cycle.

to be irrelevant because they failed to address the critical elements, such as readiness issues prior to implementation of the IT/IS project, which is critical to successful implementation (Saleh and Alsahwi, 2005). Kumar (1990) also added in practice the primary reason of post-implementation IT/IS evaluation is for project closure and not project improvement, and being carried out by system's developers, not internal stakeholders. Pre-implementation IT/IS evaluation is becoming increasingly important due to greater pressure being placed on the IT/IS function and is seen as a way of minimising some of the causes of failure and clearing the ambiguity concerning organisational goals or system requirements (Remenyi and Smith, 1999; Davies et al., 2004). Figure 3 illustrates the integrated evaluation approach in a system development life-cycle that combines the organisational-oriented (pre-implementation) and product oriented evaluation (post implementation) during IT/IS development in the organisation.

ORGANIZATIONAL IT/IS READINESS

The organisational change process is always a problematic to the organisation particularly when the changes is

due to the introduction of new IT/IS (Appelbaum et al., 1998). Karake (1994) identifies major changes in IT/IS are profoundly affecting the people, processes, structures and strategies of an organization. Katzenbach (1996) and Smith (2005) suggests the hardest things when dealing with the organizational changes lies in changing the people system that including organization's structures, planning and control systems, job specialization, training and education programs, degree of centralization, delegation and participation (Volberda, 1992).

The resistance to change might occurred due to lack of creating a sense of need and urgency for change among the employee (Kotter,1995; Clegg et al.,1997; Smith, 2005) and eventually organizational members unable to share the vision and mission for change if they do not feel any dissatisfaction with the current practices.(Smith, 2005). Lack of internal capabilities to communicate a vision and mission to its employees also can contribute to the resistance to change (Appelbaum et al., 1998; Bernerth, 2004; Smith, 2005). In their study, Cunningham et al. (2002) successfully hypothesized, that proper communication of change would improve employee's perception towards required competence, service quality and relationship and consequently reduce the possible of resistance for change. Appelbaum et al. (1998) added

that the successful organisation change only will come in reality when managers achieving the agreement or consensus of employees. This is obvious when the changes involving the introduction a new IT/IS because it is not just a change in technology, but also a change in structures, duties, tasks, and personnel. (Volberda, 1992; Jones et al., 2005).

Therefore, to reduce the resistance to change by creating sense of urgency to change and improve communication, it is essential that prior the introduction of new IT/IS, the organisation needs to determine levels of readiness for change by measuring its internal capabilities (Beckard and Harris, 1987; Schein 1990; Appelbaum et al., 1998; Smith, 2005). By knowing the level of readiness, an organization is able to create such activities that is training and education that needed prior IT/IS implementation (Appelbaum et al., 1998). A failure to assess organisational readiness prior the IT/IS implementation may result in managers spending more time dealing with the resistance to change or even worst may result in IT/IS failure (Smith, 2005).

PROBLEM OF EXISTING IT/IS EVALUATION APPROACHES

To date various methods have been developed and introduced in the field of IT/IS evaluation. However, due to the rapid developments of IT/IS, some IT/IS measurement methods become obsolete and suffered with a many problem (Smithson and Hirschheim, 1998; Kempis and Ringbeck, 1999; Remenyi and Smith, 1999; May, 2001; Saleh and Alshawi, 2005; Serafeimidis and Smithson, 20003; Leem and Kim, 2004). In their study, Kumar (1990), Saleh and Alshawi, (2005) state that the majority of current IT/IS measurement approaches are mainly post-investment measures. Small and Chen (1995), Kempis and Ringbeck, (1999) claims the organisation will lack of management guidelines to support investment decision making and they are not successful in embodying detailed and protocol evaluation procedures prior the investment. Clegg et al., (1997) found that careful and systematic measurement of the operational performance of IT/IS investments against their objectives very rarely takes place. Kumar (1990) also added that the most of IT/IS measurement has been done in practice is post-implementation evaluation that is due to the project closure and not project improvement. The product based measures are concerned mainly with technology, user satisfaction, use, and financial impact. Remenyi and Smith (1999) suggest most of the IT/IS projects implemented with technology objective and therefore, more focus on technical evaluation. Stewart and Sherif (2003); Ballantine et al., (1996) demonstrated that technology success does not guarantee that it would be accepted or used by the user. Despite of that, satisfying an individual user does not mean the systems is success. Furthermore, Grembergen and Amelincks (2004); Peacocka and

Tannirub (2005) raised the limitation of financial approaches, such as net present value (NPV), which have been shown inadequate in capturing qualitative and quantitative benefits, and techniques developed.

Process-based measures also suffer many limitations. For example, they are developed to assess the process which underpins the development of IT/IS projects and not to assess the effectiveness of IT/IS projects on business processes and business objectives (Saleh and Alshawi, 2005). In addition to these two types of measures, IS literature outlines other approaches which focus on assessing organizational maturity in terms of IT/IS planning, IT/IS infrastructure and utilization, and the management of IT/IS functions. Although the general measurement approaches explain the basic idea behind the evolution of IT/IS in organisations, they are simplistic and may not reflect reality, especially in light of the current pace of change in technology (Saleh and Alshawi, 2005).

Smithson and Hirschheim (1998) warned that the new IT/IS investment normally has social, organizational and human impacts and is not just a costs and technological activity. In the past, there has been a failure to integrate socio-technical issues with regard to IT/IS measurement (Hendrick, 1995). This is support by Willcocks and Lester (1993); Serafeimidis and Smithson, (2003) stated that in implementing and measuring the IT/IS, there is constantly lack of understanding of human and organisational issue. Many researchers has agreed with the issue of lacks of a holistic perspective on IT/IS measurement. Serafeimidis and Smithson (2003) mentioned the existing IT/IS measurement do not take into account the fact that evaluation is a socially embedded process in which formal procedures entwine with the informal assessments by which actors make sense of their situation. Therefore, they contribute to one piece of the picture but are not rich enough to describe the complex impacts within organizations. Meanwhile, DeLone and McLean (1992); Coleman and Jamieson (1994); Esther and Brooze (1995); Remenyi et al. (1996) suggests new measurement approaches are needed to support a richer examination of these intangible aspects.

PROPOSED MATURITY MODEL

The proposed model is an attempt to address the problems issues described in the foregoing:

1. The model is intended to be used prior IT/IS project implementation
2. The model is a holistic in nature and focus on soft issues which embrace all the key organisational elements; IT/IS, people, business processes and work environment.
3. The model should adopt the maturity-level techniques to facilitate the measurement of the "Readiness Gap" that is the gap between the current and the required state of

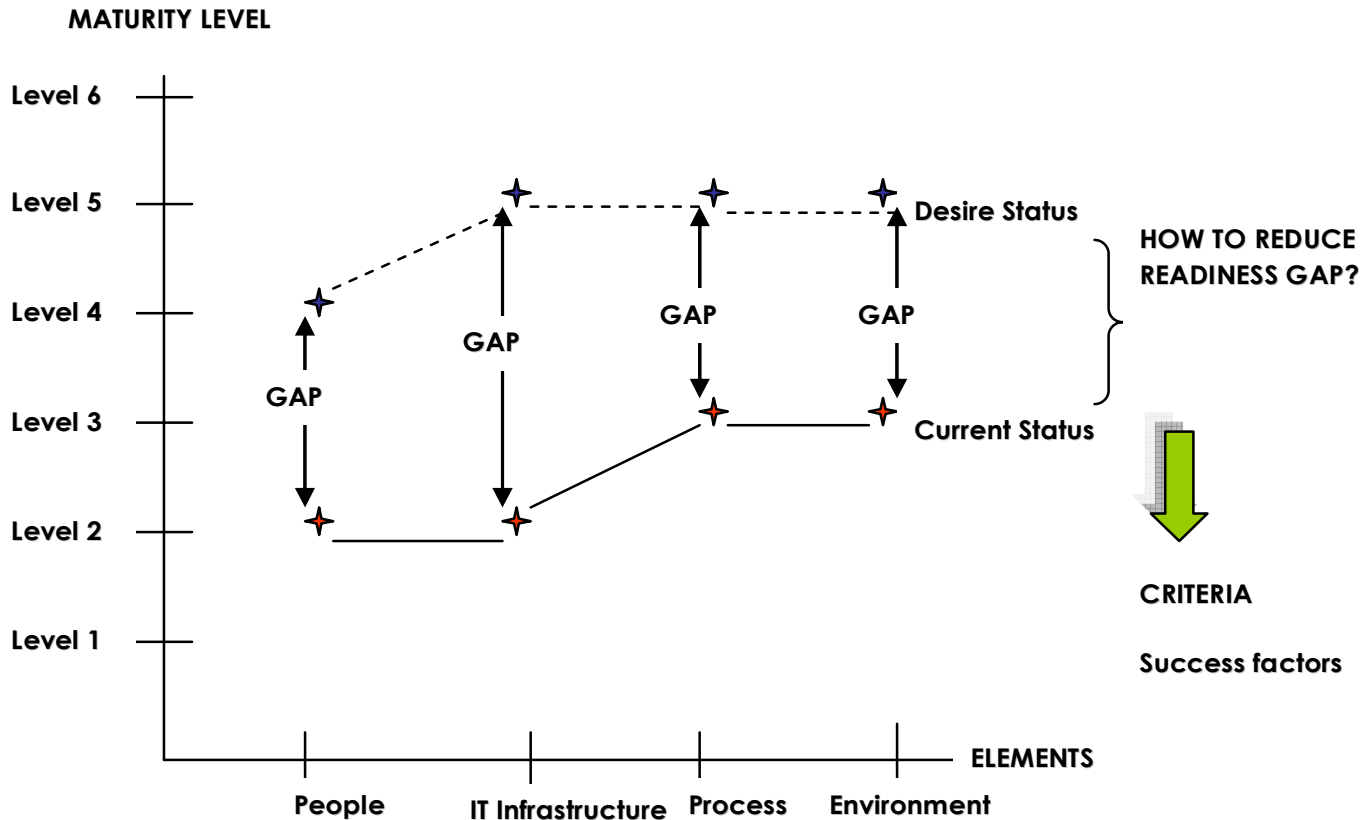


Figure 4. The Readiness gap.

readiness, prior to the implementation of a selected IT/IS

project (Figure 4).

4. Each maturity level should provide guidelines for managers to improve the readiness status and progress through the maturity levels.

The proposed model is a maturity model composed of six progressive stages of maturity that an organisation can achieve in their investment and implementation of IT/IS. These maturity stages are cumulative; which means, in order to get a higher position in the maturity stages, the organisation must comply with the pre-ordained requirements for that stage (in addition to those for all the lower stages).

Table 1 describes the scope of the proposed model. Whereas Tables 2, 3, 4 and 5 provide the summary of each elements.

The proposed maturity model offers three key IT/IS capabilities for an organisation:

1. As a tool for internal evaluation of the organisations' capability of IT/IS.
2. As an indicator to the state of the organisation's readiness prior to IT/IS investment.
3. As a road map that organisation can use for improving their IT/IS future investments

CONCLUSION

The paper highlighted the changing climate of business environment that urge a company to reshuffle their organisation in order to meet the challenge. In this scenario, IT/IS is seen as a predominantly tool to facilitate this changing. A million of dollars of IT/IS investment has been spend particularly to address this issue; However, the failure rate of this investment is still high. This is a 'wake up' call for the industrialist and researcher to review the way of IT/IS is been developed and what method and means has been used to evaluate the successful of IT/IS implementation.

This has led to the development of proposed model to provides a quick and easy reference for the manager to improve their IT/IS management toward the highest maturity stage.

Practically, is not compulsory for all key elements or attributes of the proposed model to be at the same level of maturity to be considered as successful IT/IS implementation. This is due the factors that the required state of readiness may be different for each element for any given IT/IS and the nature and requirements could vary from one organisation to another. The proposed model might be useful in that it takes a holistic view of IT/IS implementation issues. While the proposed model cannot pretend to give all the answers, it does provide

Table 1. The scope of the proposed model.

Key element	Attribute	Sub-attributes	Characteristic
IT/IS Infrastructure	Top management perception	i) Drivers ii) Aims of application iii) The Requirements	Describes top management strategic thinking and direction towards the development and utilisation of IT/IS in their organizations.
	System and Communication	i) Focus ii) Application iii) Communication	The development and utilisation of IT/IS applications in support of organisations' direction and strategic plan. The IT/IS network to support the communication and information exchange.
People	Users Involvement	i) Relationship	The level of involvement of staff in the IT/IS developments in organisations and the relationship between users and developers.
	Roles and responsibility of IT staff	i) Position ii) Roles	The roles and responsibility of IT staff in organisations who are involved in the development, implementation and management of IT/IS
	Skills	i) Type of skills ii) Training	Skills available/required to effectively implement the IT/IS in organisations
Process	Business Processes	i) Business Process ii) Success	Represented by the process "Practices" within the organisation
Work environment	Organisational behaviour	i) Characteristics	Organisations' perceptions on the use of IT/IS
	Leadership	i) Participation ii) Communication	The leadership style at both operational and strategic level
	IT Department	i) IT Governance	The role and responsibility of the IT departments to provides IT/IS services including infrastructure and applications

Table 2. Work environment element.

Level of maturity	Organisational behaviour	IT Governance	Participation	Communication
6	Knowledge culture	Hybrid/Federal	Participate in continuous improvement	Continuous communication improvement
5	Capability approach	Hybrid/Federal	Participate in measuring IT/IS effectiveness and efficiency	Well documented and integrated communication planning
4	Organisation approach	Centralised with application organization-wide policy	Participate in most IT/IS activities	Communication plan for all activities
3	Cost approach	Centralise	Participate in large IT/IS implementation	Organisation-wide policy and standards for communication
2	Technology approach	Decentralised	Ad-hoc participation	No established standards for communication
1	Ad-hoc approach	No policy control	No participation	No communication

Table 3. Process element.

Level of maturity	Business process	Success
6	Continuous improvement	Partner's project team
5	Capable to set quality goals and measure	Supply chain relationship
4	Standard description model	Business process integration
3	Documented, standardised and integrate across organisation	Business process integration
2	Identify scope	Work group team effort
1	Unpredictable and constantly change	Individual capabilities

Table 4. IT/IS Infrastructure element.

Level of maturity	Drivers	Aims of applications	The requirements for IT/IS	Focus	Application	Communication
6	Global Competition	Strategic Use	Strategic Alliances	Strategic business core-capabilities	Inter-organisational	Inter-organisational network
5	Partner's Supply Chain	Supply Chain	Supply Chain Relationships	Supply-chain	Supply-chain	Supply-chain network
4	Business Process Improvement	Organisational-Wide	Mainly In-House with Vendor Interruption	Decision making	Decision support	Organisational network
3	Organisation Communication	Organisational-Wide	Mainly In-House with Vendor Interruption	Full integration	Data management systems	Organisational network
2	Work Task Requirements	Business-Units	Partially In-House and mostly from Vendor	Information co-ordination	Business operation	Business unit network
1	Copying/Duplication	Operational Tasks	Vendor	Operational tasks	Functional	Standalone

Table 5. People element.

Level of maturity	Type of Skills	Training	Position	Roles	Relationship
6	IT core capabilities	Inter-organisational sharing experience	IT Manager with full member of board of director	Business strategy	Central IT/IS reference

Table 5. Contd.

5	Cross disciplinary		Knowledge sharing	IT Manager with senior management status	IT strategy	Permanent member in IT/IS project team
4	Decision making		Central training	IT Manager with middle management status	Organisation information management	Focus group consultation
3	Technical management	project	Central training	Technical IT Manager	Purchasing policy and centralised IT/IS activities	Focus group consultation
2	Purely technical		Team-based	IT Manager at IT department	Technical support	Individual consultation
1	Basic		Individual effort	No IT personnel	No role	No user involvement

a model which enables appropriate questions to be raised when setting out an appropriate IT/IS implementation plan. Further testing and refinement of the model is needed to provide a sufficient useable and useful model to assist managers in their IT/IS implementation.

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