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The E-Transformation Development Path: A Framework for Business Understanding

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ABSTRACT

Of the 72,000 SMEs in the Western Sydney Region of New South Wales Australia many are considering moving aspects of their business into the Internet arena. Most of these businesses however are unsure of how they should make this transformation and what steps are involved to ensure the development activities are a success. Based on work conducted by the University of Western Sydney (UWS) Australia with at least 20 SMEs, a framework has been developed that can be used as a communication tool to explain the E-Transformation development path, to identify where an organisation currently fits in this path, where the organisation can move to next and how this can be incorporated into their existing operations.

INTRODUCTION

The University of Western Sydney (UWS), New South Wales, Australia is heavily involved with SMEs in the Western Sydney Region. The School of Computing & IT (SCIT) works collaboratively with at least 20 organisations per year and the majority of the work in the last 3 years has centered on assisting the organisations to move their business into the Internet arena. Our experience has shown that although many organisations believe that they should be conducting business on the Internet almost all have no concrete ideas of how this transformation should proceed. The purpose of this paper is to propose a framework that can be used as a communication tool to explain the E-Transformation development path for small to medium sized organisations. Its value is to provide SME management with a more comprehensive understanding of the appropriate types of application development activities that should be undertaken based on an assessment of the internal state of the organisation. The framework is based on post-implementation reviews of Internet projects that have failed to deliver their expected business benefits and will continue to be refined as future project results are analysed.

BACKGROUND

There are 72,000 SMEs in the Western Sydney region and many of them have minimal if any form of Web presence. As part of our input to the local community, the UWS-SCIT runs workshops once a year to provide information to local organisations about the benefits of doing business via the Web and the possibilities that working with SCIT can provide. At these workshops it has become obvious that many organisations understand that to remain competitive they should be looking to move aspects of their business into the Internet arena but most have no real idea of where to start, if they are capable of the transition and how they could progress these activities. In a bid to overcome some of these issues UWS-SCIT has been providing assistance to organisations to develop Web enabled software solutions for the organisation. This work has incorporated undergraduate students on work experience, undergraduate student project teams, postgraduate research students and/or postgraduate student project teams. Unfortunately this work has had varying degrees of success. Some of the collaborative work has transformed a number of the organisations into true global competitors, however others have failed to even implement the software solutions developed.

Post-implementation project reviews were conducted with the SME management together with an analysis of the projects that have provided insignificant result. These investigations has uncovered that it is not the research or software that is of poor quality it is the fact that the organisation:

- Has not fully understood the E-Transformation development path and how to integrate this with their existing operations
- Did not do an accurate assessment of the organisation's capability and commitment to transform
- Did not have a high enough level of technical maturity

The first point being identified as the most significant issue inhibiting the organisation's successful advancement towards absolute E-transformation.

In a bid to overcome some of these issues this paper will propose a framework that can be used as a communication tool to explain the E-Transformation development path to SME management, to identify where an organisation currently fits in this path, where the organisation can move to next and how this can be incorporated into their existing operations.

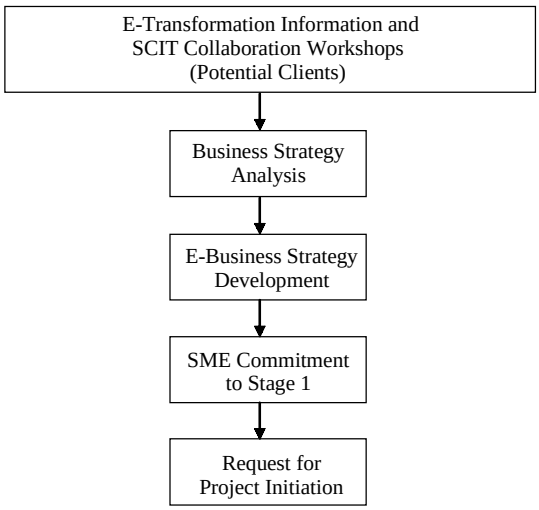
UWS RESEARCH AND DEVELOPMENT TO DATE

Workflow to decide project type

The work described above has been conducted by the E-Transformation team, which is part of the SCIT Advanced Electronic Information Management Systems (AeIMS) research group. In the early stages of this work it was agreed that a systematic workflow needed to be followed to ensure the student resources allocated to the projects understood the solution requirements. The workflow identified is shown in Figure 1.

Potential clients, who expressed an interest in collaborating with UWS-SCIT at the initial E-Transformation workshop, first underwent an analysis of their existing business strategy. This is aimed at familiarising the SCIT resources with the type and direction that the business sees it taking in the future. This activity was undertaken by a member of the research team and an external consultant. Based on this review, the input of the AeIMS research team and the consultant, an E-Business strategy was developed. This strategy identified what software solutions were needed to help the organisation move into the E-Business arena. The SME was then required to make a commitment to undertake stage 1 of the work identified in the E-Business Strategy. Once this

Figure 1: Initial E-Transformation Workflow



commitment was received a request to initiate the project was made to the Projects Coordinator. The project scope was reviewed and the project classified as either an undergraduate or post-graduate, individual or student team project. Work began at the beginning of the next academic session.

CBEADS

A new methodology for developing E-Business software solutions, the Component Based E-Application Development Shell (CBEADS) has been developed by the AeIMS research group. The main aim of the CBEADS methodology is to build each software solution as an integrated set of components. The idea of components has evolved from the Object Oriented modelling approach. Components hide their internal complexity, communicate through clearly defined interfaces, and are both configurable and extensible. Thus developers can plug-in components to an appropriate framework to build specific software developments [4]. In essence each subsequent software solution would be able to access the CBEADS library and use any existing components to speed the E-Business software solution development process.

Closer Internal Collaboration

As in any organisation, work performed by some areas is not always well publicised to other areas of the organisation. UWS-SCIT was not immune from this affliction. The SCITs Project Coordinator, who is responsible for allocating 3rd year undergraduate students to real life development projects for real business clients had experienced problems identifying and obtaining commitment from project clients in the past. To solve this problem the Projects Coordinator had initiated a stringent project evaluation process that effectively vetted each potential project client and their proposed business problems. This process was introduced to the AeIMS research group and is continuing to evolve and contributes to the framework proposed in this paper. This means that there is now closer internal collaboration within the SCIT and a consistent approach to assessing client potential and applicability of differing software solutions.

OTHER WORK ON TRANSFORMATION/STAGES MODELS

Richard Nolan has produced the best-known stages model to date. This work originally appeared in 1973 and looked at using the IS budget as a surrogate indicator for computer growth within an organisation [8]. The original 'S-curve' showing 4 stages has been revised to 6 stages and supplementary 'S-curves' added. Nolan's model does not explicitly define the terminology used or a method for assessing the level of an organisation's maturity within the stages model [2]. It is also doubtful that a single variable (IS budget) can be used to assess such complex organisational change [6]. In relation to the framework proposed in this paper, the most significant point is that Nolan's stage model does not deal with transformation within an Internet-based environment.

In 1988, Huff et al looked at how End-User computing (EUC) grew within organisations. This work suggested that EUC went through a pattern of 5 stages of application maturity. The research was primarily based on the concepts of application interconnection and the complexity of data exchanged between them [5]. The main insufficiency of this work in relation to E-transformation is that it is restricted to intra-organisational networks and was proposed before the Internet became prominent.

Applegate et al (1996) presented several texts and cases in Information Systems Management including a number of chapters on managing trends and moving from traditional electronic commerce to doing business on the Internet. The primary focus of this work is an assessment of the organisation as it moved through the growth stages from an external perspective. For example the texts look at the strategy for marketing, sales and competitor analysis [1].

The proposed framework will overcome some of the drawbacks identified in the above works by taking into consideration a) organisational growth within an Internet environment and b) the impact of doing business on the Internet from an internal perspective, that is what do we have to understand within the organisation before we consider our strategies for external marketing and sales etc…?

PROPOSED FRAMEWORK

The proposed framework has several aims.

- To outline the steps required by the SME organisation to progress through the E-transformation lifecycle and what is needed to integrate these steps with existing operations
- To act as a communication tool between business representatives and the E-Transformation analyst/s to determine the organisation's capability and commitment to transform
- To assess the level of the organisation's technical maturity

To experienced web-developers the framework may appear straightforward and self-explanatory but for inexperienced business people and students working on their initial projects, the progression path is not well understood and nor are its ramifications to day-to-day operations.

The framework as shown in Figure 2, can be used to position SME organisations within the E-Transformation development path via analysis of 4 key variables:

1. The degree to which the organisation *understands* the E-Trans formation development path and how it integrates with existing operations;
2. The *commitment* of the organisation's personnel to contribute to and accept the E-Transformation development activities. Management commitment is particularly critical here;
3. The *capability* of the organisation to undertake the E-Transfor mation activity, both from a technical and non-technical human resource skill level perspective;
4. The level of the organisation's *technical maturity*. Does the organisation possess adequate hardware and an associated techni cal architecture to complete the E-Transformation activities and is the new technology understood?

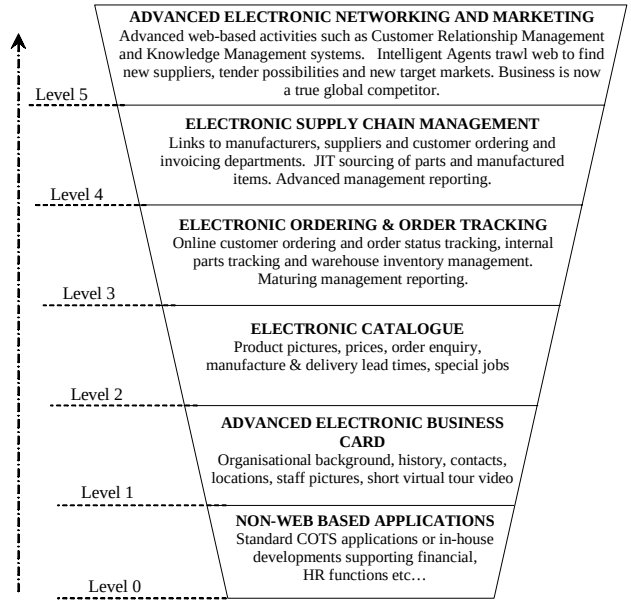
Analysis of where the organisation currently fits within the 5 levels of the framework identifies what systems need to be in place before the business can progress to a higher level and increase the complexity of system development activities.

Level 0 - Non-Web Based Applications

Description

No web-based system automation currently exists although basic business systems automation is available. Such systems may include Commercial Off The Shelf (COTS) products for financial (i.e.: MYOB) and inventory systems as well as word processing and spreadsheets. The

Figure 2: Proposed E-Transformation development path framework for SMEs



organisation may also have more advanced non web-based systems for payroll, invoicing etc

Level 1 - Advanced Electronic Business Card

Description

A static website that has no user interactivity with a database as far as client, product or manufacturing data. Web pages display information about the organisation's background, history, mission, goals, management structure, general contact information, staff photos, business location details and photos or some combination thereof. Should also include a Content Management System that allows users to add, modify or delete content including text and graphics. Web site is hosted by an external ISP.

Level 2 - Electronic Catalogue

Description

Provision of an online product catalogue and collection of basic site visitor information. The catalogue is sourced from a database and visitor data is collected and stored in a database. Full information about products manufactured and/or sold with graphics and/or associated models. May or may not include product pricing based on sensitivity of competitor market. Potential clients may request a quote for a product or group of products via email. The site may also contain more detailed information about manufacturing/lead times and purchasing terms and conditions. Some business processes are starting to become 'web-aware' if not fully enabled. Majority of processes are still manual or based on non-web systems operated by internal resources. An external ISP may still host web site but thoughts are starting to turn towards bringing it in-house.

Level 3 - Electronic Ordering and Order Tracking

Description

Customers can now place orders online and track the status of their order via the web site. Orders are stored in a database and invoices are automatically generated and alert reporting is available on overdue invoices. Details of parts on hand and manufacturing requirements are available from the database and online warehouse inventory management takes effect. Advanced management reporting is available although management are not taking full advantage of stored data analysis. Major business processes have been re-engineered and internal resources are experiencing significant workflow changes. New positions may be created or existing position descriptions may be amended to take advantage of new marketing opportunities. The web site hosting may now be conducted in-house due to the perceived sensitivity of the data being transferred between affected parties. (If this is not done at Level 3 it is being seriously considered.) NB: Level 3 is the most detailed and complex level within the proposed framework and development may be conducted in incremental stages.

Table 1: Variable characteristics of Level 1 of the E-Transformation Framework

Variable	*Organisational Characteristics*
Organisational Understanding	Understanding of the E-Transformation development path is limited at this level. Management believe they should have an Internet presence to remain competitive but do not fully understand what is possible or what strategy they should be following.
Commitment	Organisational resources may be very unsure of how this new approach affects them and how they can contribute to its success. Commitment may therefore be very limited.
Capability	Little if any training of organisational resources has occurred. If training has been undertaken it would typically have been done by management and/or the technical staff.
Technical Maturity	Typically no new hardware has been purchased and minimal changes have been made to the technical architecture. If no technical architecture was in existence before this activity, the business analyst should create a formal model describing the technical environment including software and hardware.

Table 2: Variable characteristics of Level 2 of the E-Transformation Framework

Variable	*Organisational Characteristics*
Organisational Understanding	Understanding of the E-Transformation development path is growing but is still limited. Management are now seeing their product online and believe they have access to a larger market and are becoming more competitive. Starting to think in more detail about strategic impacts.
Commitment	Organisational resources are becoming excited about new business features and can now start to talk about the organisation's web site and its contents to outsiders. Details of long-term effects may still not be clear but commitment is starting to grow.
Capability	Training on how to use the site and assist current and potential customers is/has been conducted for immediate support staff. Technical staff are beginning to look for additional training to further the organisation's E-transformation activities.
Technical Maturity	Some new machinery may have been purchased to 'keep up with' the new technology that has been implemented. Investigations may be starting on the feasibility of in-house web site hosting and associated costs. Management are starting to discuss further technical possibilities for the organisation.

Level 4 - Electronic Supply Chain Management

Description

An electronic supply chain consists of suppliers, manufacturers, product transporters and distributors. All of these parties are linked electronically and can transmit details relating to orders and distribution across the chain electronically. Orders placed online and manually input are analysed and details for parts/products are transmitted directly to the manufacturer/supplier. Once orders are filled, the transport is arranged and order delivered to retail outlets or individual customers [8]. Information regarding work status along the chain is available online and most communication is conducted electronically. The most significant issue with this level is the electronic linking of all parties IT systems [8]. Some common tools must be agreed upon and considerable system integration development work is usually required. Advanced management reporting is conducted as a great deal of data is being stored on many aspects of the business' operations and its interactions with supply chain partners. Web site is now hosted in-house.

Level 5 - Advanced Electronic Networking and Marketing

Description

Advanced web-based technology such as Customer Relationship Management and Knowledge Management systems are now implemented to fully utilise data and supply chain relationships already in place [3,7]. Intelligent Agents trawl the web to find potential new suppliers and distributors, locate tender possibilities and identify new target markets. New and/or amended positions will be required to

Table 3: Variable characteristics of Level 3 of the E-Transformation Framework

Variable	*Organisational Characteristics*
Organisational Understanding	Understanding of the E-Transformation development path has taken a significant leap forward and management is now pro-actively analysing future business strategy development. Review of previous web site development from Levels 1 and 2 may be undertaken based on the increased degree of understanding.
Commitment	Organisational resources are now operating with new workflows and will make the ultimate decision to stay with this employer or move on. This decision may well be based on their level of capability (see below). Those resources that choose to stay are now heavily committed to the new technology and can move between web-based and non web-based business processes quite easily.
Capability	Longer-term effects of the E-Transformation strategy are now understood and training on work with the web-based processes has been extensive and resources should feel confident with new operating procedures. Some frustration may emerge due to running of both web-based and non web-based systems although front-end portal integration should have been addressed by now (see below).
Technical Maturity	Management needs to have increased the technical budget at this level and some significant machinery upgrades should have been undertaken to deal with advanced processing (and possibly bringing the web site hosting in-house). Technical staff should also have developed a workflow portal that allows access to all web based and non web-based systems through one interface. They are now very conversant with web technologies and networking architectures. Preparing technical architecture for further advancements in Level 4.

Table 4: Variable characteristics of Level 4 of the E-Transformation Framework

Variable	*Organisational Characteristics*
Organisational Understanding	Understanding of the E-Transformation development path is now very mature and management considers e-business as a major component of current and future business strategy development. Based on this understanding a review of previous web site development from Level 3 will probably be needed to integrate with supply chain partners.
Commitment	Organisational resources exhibit strong commitment as nearly all workflows interact with the E-transformed systems in some way. New employees attracted by the advanced electronic business systems arrive committed. Use of the web-based systems is considered normal operating procedures.
Capability	Resources now look for additional opportunities for reengineering non-web based and web based business processes. Extensive training has been undertaken and staff are well versed in the E-transformed systems operations.
Technical Maturity	Management must be committed to allocating significant budget to advance the technical architecture so that it can support the electronic supply chain. Technical staff are highly skilled and may be head hunted by competitors. Network and machinery updates will be required. Further development on the workflow portal needs to be conducted to integrate 'chain' participants systems.

Table 5: Variable characteristics of Level 5 of the E-Transformation Framework

Variable	*Organisational Characteristics*
Organisational Understanding	Understanding of the E-Transformation development path is now fully matured and management is constantly looking for ways to leverage its strong e-business strategies. Regular updates on the state of E-business technologies and tools and the systems of competitors and supply chain partners needs to be conducted to stay up-to-date with the rapidly moving e-business arena.
Commitment	Organisational resources consider the Internet based systems to be vital to the organisation's continued success. Commitment is at its highest level and job descriptions are totally integrated with the Internet systems.
Capability	Resources have received extensive and specific training to enable them to take full advantage of the systems and data available. Continued training will be required due to the rapidly changing Internet environment but staff are now highly qualified to operate e-transformed systems.
Technical Maturity	High levels of technical maturity are evident with advanced network and security configurations. Some additional budget may be required for the increased processing power required for the CRM and KM systems and the data mining activities they carry out. Continued integration efforts are required as new partners join the supply chain. Ongoing research will be required to ensure leading edge solutions continue to be developed.

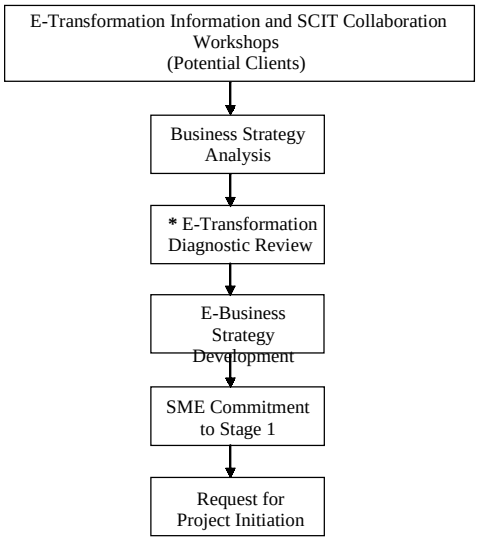
leverage the information drawn from the organisation's systems. Travel may be required to establish new partners identified by the Intelligent Agents. Customer base is worldwide and the business is now a true global competitor.

FUTURE WORK

Initial discussions regarding the framework with past project clients and previous student project team members has been positive and most concur that the framework would have helped them to target an appropriate E-business strategy at an early stage and to justify application development activities. The proposed framework now needs to be further ratified by introducing it into the E-Transformation workflow model as shown in Figure 3. A new activity has been included - an E-transformation diagnostic review. This activity involves assessing the potential client organisation in line with the proposed framework. The assessment will determine at what level the organisation is currently positioned and what E-business application development strategies should be considered in the following activity – E-business strategy development.

Assessment of the success of the new activity will need to occur and adjustments or enhancements made to the framework. Follow up articles using explicit case studies will also be published.

Figure 3: New E-Transformation for SMEs Workflow



CONCLUSION

Work with SMEs in the Western Sydney Region of New South Wales Australia by the University of Western Sydney has indicated that although many businesses believe they should be conducting business on the Internet most are unsure of how they should proceed with an E-Business application development strategy. The E-Transformation framework proposed overcomes these issues by acting as a communication tool with SME management to explain the E-Transformation development path, identifying where an organisation currently fits in this path, where the organisation can move to next and how this can be incorporated into their existing operations. The 5 levels of the framework identify what systems should be in place and move the business through growing degrees of complexity of system development activities. Identifying the level at which a business is currently placed occurs via the analysis of 4 key variables:

- Organisational Understanding
- Commitment
- Capability and
- Technical Maturity.

Results of the analysis lead to the development of a more appropriate E-Business application development strategy for each individual SME and thus increase the probability of the businesses success in the competitive E-Business arena.

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