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Abstract

Collaboration can be enabled by the use of web technologies. This paper outlines a project established to investigate possible strategies that could be adopted by Australian toolmakers to allow them to be more competitive in the global market. Results show progress in eTransforming their organizations and steady movement towards eCollaboration. It is suggested that trust is a crucial underlying aspect of successful collaboration. Future studies include the expansion of the framework and strategies to other Australian toolmakers.

Keywords

eCollaboration, eTransformation, competitive advantage

INTRODUCTION

Over the past decade organizations have progressively used Internet technologies to transform their businesses. Initially email and creation of websites offered a range of services to conduct business electronically. More recently organizations that have mastered some of the technologies are looking to further change their business processes to leverage the opportunities offered by a global marketplace, for example, small and medium enterprises (SMEs) collaborating with each other in order to gain a competitive advantage. A number of issues arise with making this higher-level transition, such as lack of knowledge and expertise, cost and time to undertake the transformation. In addition, current predictions are that business will be predominantly conducted online and organizations that are slow to embrace web technologies will be left behind (Lawson et al, 2003). Some organizations are exploring the move towards eTransformation, while others are moving further along the eTransformation path.

eTransformation

eTransformation is a planned and evolutionary move towards leveraging web technologies to enhance business. In addition to implementing the technologies, this move is characterised by the need to evaluate processes within the organization and manage relationships (Al-Mashari, 2001). Certainly, organizations can take a step-by-step approach that suits their industry sector and customer base.

This study was undertaken in the south-west region of Sydney, which has the fastest growing economy in Australia, and consists of 10% of the population. Over 80% of the 72,000 businesses in this region are SMEs, with manufacturing among the largest industry sectors. Manufacturing SMEs with a website in the region stands at 65% in 2003 (Khandelwal et al, 2004), which has risen from 41% in 2000 (Lawson et al, 2003). Key factors that inhibit eBusiness activities have not dramatically changed over time, with major barriers including lack of IT expertise, cost and time to implement. The Advanced Enterprise Information Management Systems (AeIMS) Research Group at the University of Western Sydney (UWS) has been at the forefront of the region in researching and collaborating with local industry associations and SMEs. Examples of the research include a methodology for successfully transforming SMEs to eBusinesses – see Figure 1 (Ginige et al, 2001) and the development a strategic model to undertake the transformation – see Figure 2 (Arunatileka & Ginige, 2003).

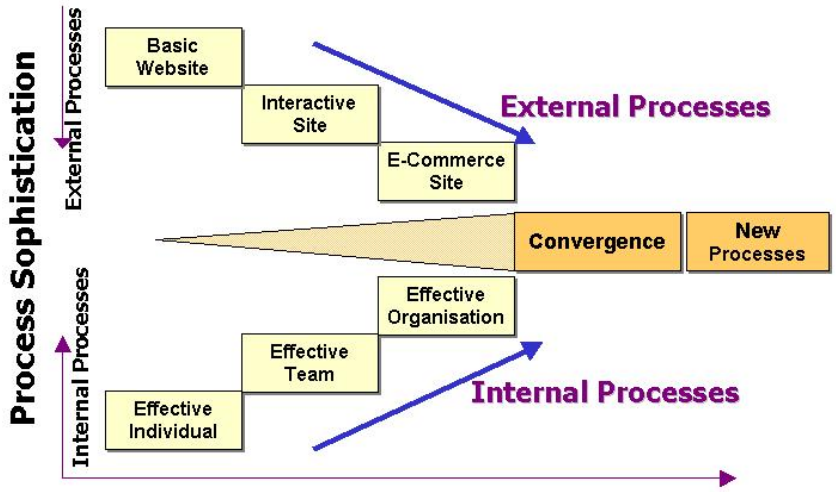

Figure 1: eTransformation Roadmap (Ginige et al, 2001)

Studies of web sites and changing business processes led to the progressive creation of a number of phases that an organization can move through to successfully eTransform their organization (Ginige et al, 2001).

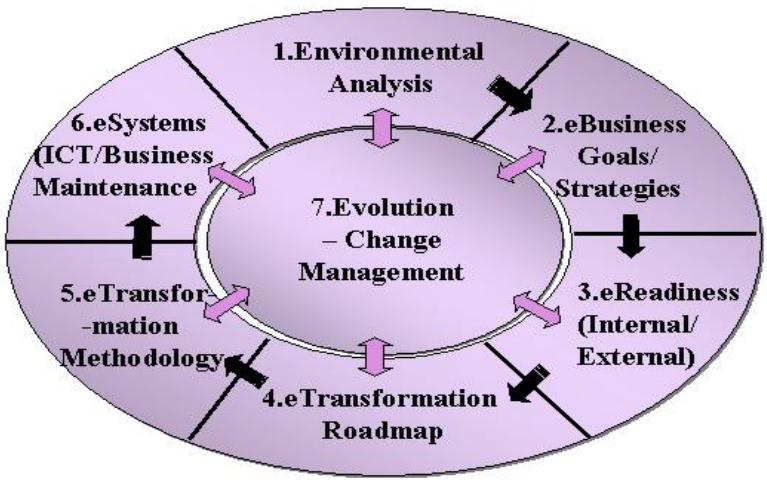

Figure 2**:** 7E Model in Transformation (Arunatileka & Ginige, 2003)

The seven E's in transformation was developed from an analysis of existing eTransformation methodologies and models (Arunatileka & Ginige, 2003). The seven factors, which comprise the seven E's model was applied to the participating SMEs in this study. This model represents the process that a single SME can utilise in transforming their business to an eBusiness.

eCollaboration

eCollaboration is defined as partnerships or teams using information and communication technologies (ICT) to achieve a common goal (Kock & D'Arcy, 2002). For instance, two organizations in the manufacturing industry (one manufacturing a plastic bottle, the other a plastic lid) have successfully collaborated to market one product, a plastic bottle with a lid (Ginige, 2004). Some resistance to change is apparent, despite the increased awareness of benefits from eCollaboration, and therefore a high level of trust is required for it to be successful (Schuster, 2002). Perceived interaction qualities, both interpersonal and technological are vital to developing trust, as is satisfaction with the collaboration process (Hol & Lawson, 2004). Indeed, Boddy et al (2000) have identified that making the decision to work collaboratively is easier than the implementation.

The 7E Model in eTransformation (Arunatileka & Ginige, 2003) illustrates the path that can be undertaken by a SME. This study examines the eTransformation process within each of the participating SMEs, and in addition, investigates the collaboration process among these four organizations. Kock & D'Arcy (2002) assert that there are six factors that make up eCollaboration and are relevant to this project. The factors are: The collaborative task: toolmaking jobs beyond the capacity of one of the toolmakers;

- The eCollaboration technology: IT infrastructure deployed to the toolmakers;
- The participants: the four toolmakers, Austool Limited, and UWS researchers;
- Mental schemas of the participants: The knowledge and experience of: (a) the toolmakers in producing their products; (b) Austool in understanding the industry and skill sets; and (c) UWS researchers in deploying the infrastructure;
- The physical environment: the geographical location of the toolmakers, which are not co-located and therefore need to apply effort to eCollaboration;
- The social environment: the perceptions of trust among the participants as well as peer pressure among the toolmakers.

Ginige (2004) argues that organizations with the same capabilities can collaborate to gain advantage by acquiring jobs beyond the capability (in size and/or complexity) of a single organization. Ultimately, what is important is gaining the competitive advantage by increasing market share and lowering costs, and therefore maximising profit and return on investment. The technology and methodology utilised enables the main objective to be achieved in a seamless, user-friendly and cost-effective way (DeZoysa, 2001). Trust between participants is a key factor, particularly within the project so that the project aim is realised. Trust between the four toolmakers when undertaking collaborative projects is also an important factor (Beckett, 2005).

Toolmaking Industry in Australia

The Australian Toolmaking Industry is part of the wider Manufacturing Industry, and consists of about 600 organizations with over 6,000 employees. The majority of these organizations fit into the SME category (ABS, 2004), with ninety percent employing less than 50 staff. Over the past decade there has been a reduction in employment, which corresponds to an increase in imported tooling. The 2004 Austool Industry Report emphasizes that collaboration is essential for the industry to survive and prosper, as is access to international markets (Jenkins, 2004).

Austool Limited is an association committed to advancing the Australian toolmaking industry and is located in south west Sydney. The four participating toolmaking SMEs are members of Austool. They did not have a website, and carried out business in the traditional manner in toolmaking with manual systems and face-to-face communication. At the start of the project the four toolmakers, the members of the AeIMS research team and Austool project leaders had had only minimal contact with each.

THE STUDY

A qualitative study using Action Research methodology was undertaken and this project represented one cycle within the Action Research framework. Techniques of questionnaires, interviews and observations were conducted, as well as a series of joint meetings. To fully understand and document the process necessary for eCollaboration, the iterative process of Action Research was selected as it encapsulates the steps of diagnosing, action planning, action taking, evaluation and specific learning. In addition, it allows interaction between the researchers and the participants with a view to improving the quality of actions taken within the project (Avison et al, 1999).

The overall aim of the project was to examine possible strategies that could be adopted by Australian toolmakers to allow them to be more competitive in the global market. Specific objectives for this cycle of the Action Research methodology include:

- application of the 7E Model in eTransformation;
- examination of the implementation of eCollaboration strategies;
- investigation of the viability for further deployment of the strategies; and
- evaluation of improvements in this cycle of the Action Research methodology.

RESULTS

7E Stage 1: Environment Analysis

A study undertaken by Austool Limited (Jenkins, 2004), revealed that the reasons for the downturn within the Australian Toolmaking industry included:

- a shrinking domestic market due to migration of manufacturing to foreign countries;
- excess capacity due to reduced domestic market demand and new technologies;
- customer demand for lower prices and more services;
- rising costs, particularly labour-related costs; and
- commercial uncertainties that may restrict investment in new technology.

The emergence of new competitors in low cost countries such as China and Korea has impacted on the toolmaking industry worldwide, resulting in the shrinking of the industry in Western countries. Trends in global toolmaking include:

- integrated production (China);
- advantages of low cost (China);
- skilled labour (China);
- strong international sales and marketing (China, Taiwan);
- design in Taiwan – manufacture in China;
- shorter lead times and competitive prices (China, Taiwan);
- pooling resources through consolidations and mergers (USA);
- adoption of latest computer technologies for manufacturing (Portugal);
- clustering and cluster development strategies (Slovenia).

Virtual organizations have been established, such as the National Tooling Initiative (NTI) in South Africa, which has successfully brought together car manufacturers, automotive industry associations, tool rooms, suppliers, training institutions and government bodies (Engineering News, 2004). Companies are buying out, or merging with other companies to strengthen their resources in an age of global competition and heightened demands from customers. Another motive for consolidation is that many customers favour large full-service organizations, as they do not have the resources to handle many small suppliers (PIMMA, 2000).

The major problems are that Australian toolmakers have higher labour costs, longer production runs and less cost effective pricing strategies. They also appear to adopt new technologies later than overseas competitors (Jenkins, 2004). To address the downturn, the toolmaking industry is keen to address the issues to achieve global competitiveness.

7E Stage 2: eBusiness Goals/Strategies

The four toolmakers participating in this study agreed to collaborate with each other, by utilising eTransformation strategies to increase their competitiveness as individual organizations, and as a combined virtual organization. Austool Limited is participating to evaluate the experiences of the four toolmakers with a view to expanding the strategies to other Australian toolmakers, and the following success factors have been identified:

- improved customer engagement;
- maintaining more effective technology diffusion;
- going global;
- integrating with the supply chain;
- rapid incremental innovation.

Austool's CEO and the project leader were interviewed as part of the project. The ranking of the toolmakers by Austool revealed that these four SMEs were at the smallest end of toolmakers in terms of size with less than ten employees. In terms of capacity of machinery, one organization would be termed as medium. However, in terms

of quality all four organizations were at the high end, and therefore suited to working collaboratively. The issue of turnaround time was identified as a problem when working individually. Breaking down the barriers between the toolmakers was recognized as an issue to be overcome, as previously the toolmakers had been competitors. Trust needed to be established so that collaboration could take place.

To move the toolmakers higher in their ranking, Austool believes that increased capability through collaboration is necessary. Combined purchasing was also identified for steel and plastic supplies. Although Austool was not interested in participating with the toolmakers on a day-to-day basis, they did however see a role in acting as an intermediary to promote the collaboration. Marketing capabilities, strategic alliances and expanding the product lines were seen as strategies to move the organizations forward.

7E Stage 3: eReadiness of Toolmaking SMEs

The toolmakers had been in business for up to 15 years and their main business was in precision engineering, plastic injection moulding and press tools. Members of the research team visited each toolmaker on a number of occasions to evaluate the day-to-day activities, and to ascertain requirements for the websites. On each occasion the owner was interviewed. The level of IT infrastructure was low, with dial-up Internet connections, PCs with Windows 98 or XP, no IT support structure, and word processing, email, and some CAD/CAM applications.

Business processes were discussed and a SWOT analysis carried out (see Table 1). The benefits that the four SMEs expected from the eCollaboration project included:

- purchasing power of four;
- ability to build tools faster;
- sharing of IT and other expenditure;
- market toolmaking collectively and individually;
- opportunities for international markets;
- increase in capability
- opportunities in other local industries.

Strengths	Weaknesses
Machine capability Skill to do any toolmaking Quality Designing Production capability Experience in the industry Strong industry association	Manpower Marketing High labour costs Difficulty in lowering production costs Location and building capacity not sufficient to organise properly Shortage of manufacturing tools in Australia
Opportunities	***Threats***
New customers New customer industries: - building, construction, plumbing, food, household, automobile, medical, energy, electronic, aerospace, mining International customers New markets	Overseas competition: - China, Taiwan, Korea Australian toolmaking not keeping pace with technology Larger companies investing in China and Taiwan Manufacturing in Australia declining Shortage of toolmakers Local competition for jobs

Table 1: SWOT Analysis of the four toolmaking SMEs

Existing niche markets were identified as: household, food, plumbing, construction and components. Potential niche markets include automobile, building, construction, energy, electronics, medical and sports.

The driving forces for eCollaboration acknowledged by the four SMEs were to:

- reach new customers;
- globally market individually and collectively;
- work collaboratively;
- increase market share;
- increase product range;
- gain competitive advantage;
- eliminate bottlenecks; and

- improve on technology.

Issues and concerns raised by the four SMEs include:

- trust;
- degree of collaboration;
- how to distribute the jobs;
- unified and equal standards;
- liability of work that the group undertakes;
- who makes final decisions;
- common understanding; and
- service level agreements on joint projects (jobs, payment, management).

These issues were discussed at joint meetings, with the understanding that some of these points need to decided by the toolmakers, particularly in relation to dividing the jobs. The project will provide the IT infrastructure to enable job sharing and quoting.

7E Stage 4: eTransformation Roadmap

To move the toolmakers onto the eTransformation Roadmap, the first phase established a basic website for each SME. The next phase identified strategies for collaboration by the group. Figure 3 shows the interactions possible at the business-to-customer, business-to-business and business-to-employee levels.

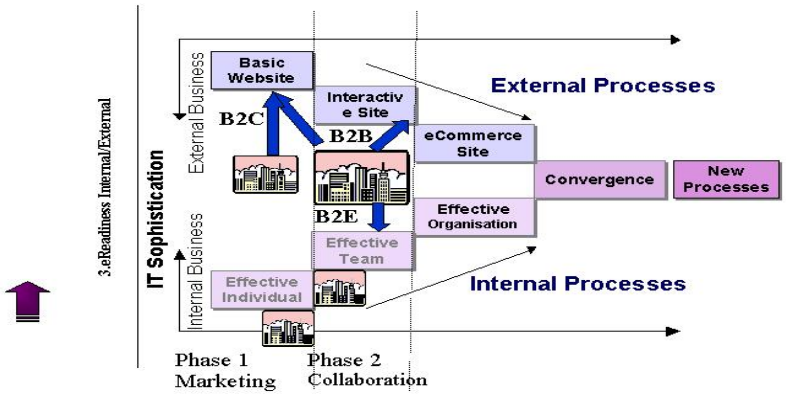

Figure 3: Toolmakers position on the eTransformation Roadmap

7E Stage 5: eTransformation Methodology

Based on the data collected and analysed from the four toolmaking SMEs and from Austool Limited, the critical success factors for the toolmaking industry were identified, namely strategic marketing and eCollaboration based around the core issues of price, quality and delivery time (see Figure 4).

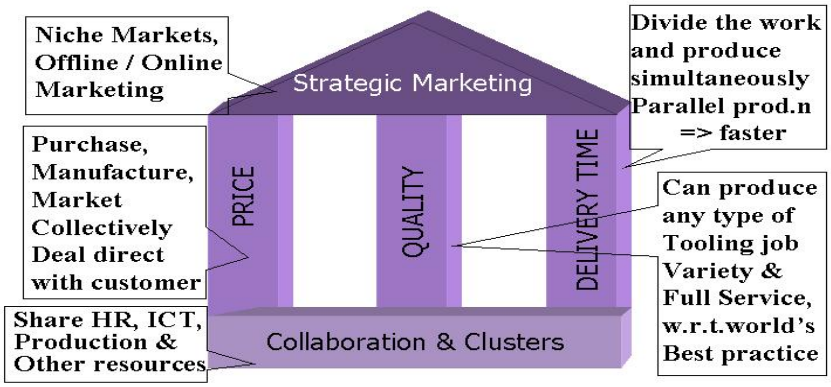

Figure 4: Proposed Strategies for Toolmakers

Ways for these four toolmakers to collaborate include Strategic Marketing, Resource Sharing, Project Sharing and Purchasing.

Strategic Marketing involves establishment of a website for each toolmaker, which will be followed by a portal to market the group. Austool also has a role to play in marketing through their organization. Resource Sharing includes sharing of staff, software licences and production capability. Project Sharing is based on projects that individual toolmakers acquire as well as projects that are acquired by the group. Purchasing from common suppliers can result in reduced costs.

The introduction of IT to enable strategies was introduced at the individual level, and then after a period of adjustment at the group.

7E Stage 6: eSystems ICT/Business Maintenance

To determine how the implementation of the strategies could proceed, an IT Audit was conducted. The report documented the analysis of the current infrastructure and design for the upgrade to allow the strategies to be deployed.

The individual websites were designed and launched to provide each toolmaker with an initial marketing tool. A Content Management System was progressively deployed to each of the websites to allow easy enhancements and maintenance to be undertaken. In addition a website marketing plan was created to increase the visibility of the businesses.

The development of the eCollaboration Tool for quoting was undertaken as a sub-project with the toolmakers providing input and feedback to the developers. The tool allows each SME to create individual quotes, as well as contribute to group quotes. The UWS research team provided maintenance and support for a period of six months after deployment. During this period researchers studied the process of collaboration from both a technological and business process perspective.

The toolmakers agreed that the IT infrastructure required to achieve eCollaboration would initially be a peer-to-peer strategy (see Figure 5). The reason for this decision was based on cost involved, the level of existing infrastructure and IT skills of the toolmakers. Issues to be addressed by the toolmakers include providing Internet access and undertaking training. Austool agreed to promote and market the collaboration project.

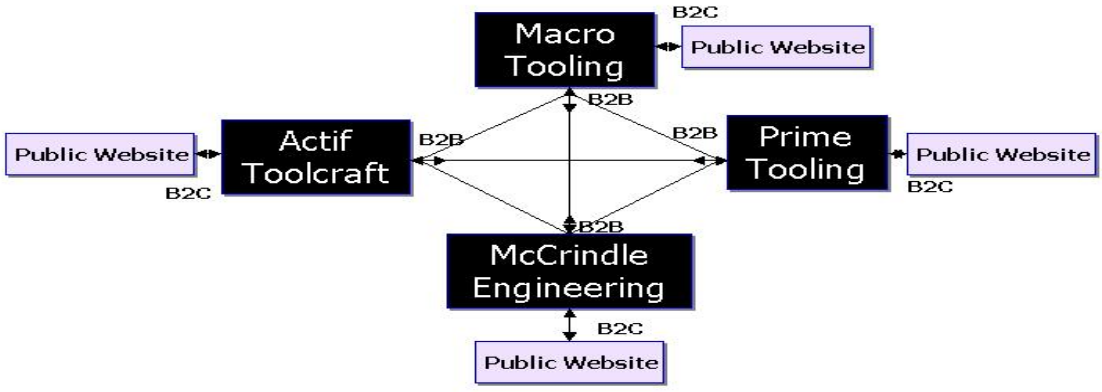

Figure 5: Proposed Peer to Peer (P2P) Strategy

7E Stage 7: Evolution – Change Management

This stage involved managing the changes in an evolutionary manner through all other stages of the 7E Model. Issues that arose during the project included overcoming a degree of resistance by the toolmakers particularly in relation to time, negotiating amended timelines with Austool Limited, and building trust. Deadlines needed to be moved on a number of occasions while developing the initial website, decisions related to the SMEs owning their own domain name and mapping the processes for the job sharing and quoting software.

Initially, trust was apparent between the toolmakers and Austool Ltd, and this increased between the toolmakers and researchers during the project. The researchers placed a concerted effort on these relationships, which continued during the support and maintenance phase.

Action Research Methodology

From the Action Research perspectives, the following improvements were noted:

1. Toolmakers' change of thinking about the operation of their business, which was measured by their actions in utilising the capabilities of their collaboration partners in terms of machinery, expertise and time;

2. Incorporation of electronic means of communication in the promotion of their businesses, as evidenced by the inclusion of email and website addresses on their marketing material; and

3. Increased level of trust between the toolmakers allowing them to collaborate effectively. Also, trust developed between the toolmakers and the researchers. This was particularly clear when decisions needed to be made. At the start of the project very long discussions at meeting were needed to reach decisions. Whereas more recently decisions were made via email, or toolmakers agreed in principle and the detail of decisions was left to the researchers.

DISCUSSION

The motivation for the collaboration came from the toolmakers themselves and they remained committed throughout the project. However, the slowness in implementing the stages of the project also came from the toolmakers. It was not a technology issue, but rather a trust issue, and the constant day-to-day business demands on the toolmakers. The researchers anticipated some resistance to the technology, but did not identify the other aspects.

The first objective of this project was the application of the 7E Model in eTransformation. Analysis of the results to date suggests advantages are achievable through collaboration among the toolmakers. Certainly, non-technical issues such as social, behavioural and strategic management dimensions will ultimately drive the collaboration beyond the support and maintenance phase of the project. As discussed, collaboration and access to international markets are essential for the toolmaking industry to survive and prosper in Australia. The toolmakers have made the decision to work collaboratively and, as identified by Boddy et al (2000), successful implementation is posing some challenges.

Once placed on the eTransformation Roadmap, the 7E Model provided a framework for analysis of the process outlined in this project. The participants became aware of their own position, and that of the other toolmakers. This process contributed to trust relationships developing among the toolmakers, and between the toolmakers and the researchers. Indeed, trust is integral to the Evolution-Change Management phase...

The second objective of this project was an examination of the implementation of eCollaboration strategies including web site marketing, resource sharing, project sharing and purchasing. During Stage 6 of the 7E Model this examination was carried out and led to the development and trial of the software tools for job sharing and quoting. Further analysis of the results using the six factors of eCollaboration as defined by Kock & D'Arcy (2002) is planned, particularly the mental schemas of the participants.

Analysis of the goals of the toolmakers indicate agreement between them, in addition to being consistent with the goals of Austool, such as improved customer engagement, more effective technology diffusion and competing in a global environment. When evaluating the eReadiness of the toolmakers, a high level of commitment to the process was evident, despite the low level of IT infrastructure within the organizations. Even with this high level of commitment, delays still occurred, and addressing the trust issue at an earlier point would have assisted a stricter adherence to deadlines.

In line with the Action Research nature of this project, it was identified that it would be necessary to develop the initial website before proceeding with other aspects of the project. This enabled the toolmakers to be placed on the eTransformation Roadmap, and did indeed improve the trust levels with the visual development of the website.

The third objective of this project was an investigation of the viability for further deployment of the strategies. The environmental analysis highlighted the major problem areas as higher labour costs, longer production runs and less cost effective pricing strategies. The outcomes from this project strongly suggest that further deployment within the toolmaking industry would see a reduction in the identified problem areas.

The fourth objective of this project was an evaluation of improvements in this cycle of the Action Research methodology. Improvements were noted by the toolmakers in trust, thinking about the way they do business, and in the use of electronic means of communication. Evaluation of the cycle by the researchers revealed the need to incorporate a more integrated technique to build trust more quickly during the project. Future studies will trial this technique.

CONCLUSION

The overall aim of this research project was to examine possible strategies that could be adopted by Australian toolmakers to allow them to be more competitive in the global market. The cycle of the Action Research methodology addressed by this paper trailed the application of the 7E Model in eTransformation and examined the implementation of eCollaboration strategies with four toolmaking SMEs. The outcomes of this project strongly suggest that further deployment of the strategies to the Australian toolmaking industry is viable.

The 7E Model in eTransformation was used to move the toolmakers through the phases and to highlight issues and challenges in the process. It also created awareness for the eCollaboration strategies necessary for achieving their goals of working together, increasing their market share and global marketing. The issue of trust was identified as critical to the success of continued collaboration. Future cycles of the Action Research framework for this research will include social, behavioural and strategic management dimensions.

Action research methodology proved to be appropriate for this type of project, as it allowed for reflection of findings during the project, which resulted in changes being made. Action Research is an iterative process

suitable for the 7E Model, with steps for diagnosing (Stages 1,2,3,7), action planning (Stages 4,5,7), action taking (Stages 6,7), evaluation and specific learning (all stages).

Future projects in this research involves (1) building the integrated technique to overcome the trust aspect more quickly and trailing it in another eCollaboration project, perhaps in another industry sector, and (2) applying the framework and methodology to a larger number of toolmakers in conjunction with Austool Ltd, which will move the Australian toolmaking industry towards being more globally more competitive.

In conclusion, the framework and methodology outlined in this paper can be tested in projects that design, implement and assess eBusiness solutions for SMEs. If virtual organizations are the way of the future, then eCollaboration technologies will enhance the ability for SMEs to gain a competitive advantage.

REFERENCES

Al-Mashari, M (2001) eTransformation – are we ready for the challenge? *Business Process Management Journal*, Vol. 7, No. 4, p.302.

Arunatileka, S, Ginige, A (2003) The seven E's in e Transformation – a strategic eTransformation model, *e-Society 2003 Conference*, Lisbon : Portugal

Australian Bureau of Statistics (2004) www.abs.gov.au, Accessed 8 May 2005

Avison, D, Lau, F, Myers, M & P. Nielsen (1999) Action research, Communications of the ACM, Vol. 42, No. 1, pp.94-97.

Beckett, R (2005) Some issues in collaborations, presentation at Austool seminar on 29 June.

Boddy, D, MacBeth, D & B Wagner (2000) Implementing collaboration between organizations: an empirical study of supply chain partnering, *Journal of Management Studies*, Vol. 37, pp.1003-1027.

DeZoysa, S (2001) Who do you trust? *Telecommunications International*, Vol. 35, No. 12, pp. 70-72.

Ginige, A (2004) Collaborating to win – creating an effective virtual organization, *International Workshop on Business and Information*, 26-27 March, Taipei, Taiwan.

Ginige, A, Murugesan, S & P Kanzanis (2001) A road map for successfully transforming SMEs into e-businesses, *Cutter IT Journal*, Vol. 14, No. 5, pp. 39-51.

Hol, A, Lawson, R (2004) Role of social and human capital in virtual collaboration, *IADIS International Conference, WWW/Internet 2005*, 6-9 October, Madrid, Spain, pp. 1035-1038.

Jenkins, B. L. (2004). An Australian Tooling industry technology road map exploratory study 2003/2004. Austool Limited Report

Khandelwal, V, Ginige, A, Curry, J, Bajaj, K, Lan, Y & R Schmid (2004) *Information Technology in Western Sydney: Status and Potential, Survey 2003*, Parramatta : University of Western Sydney.

Kock, N, D'Arcy, J (2002) Resolving the e-collaboration paradox: The competing influences of media naturalness and compensatory adaptation. *Information Management and Consulting* (Special issues on Electronic Collaboration), Vol. 17, No. 4, pp. 72-78.

Lawson, R, Alcock, C, Burgess, L & J Cooper (2003) Factors affecting adoption of electronic commerce technologies by SMEs: an Australian Study, *Journal of Small Business and Enterprise Development*, Vol. 10, No. 3, pp. 265-276.

Schuster, K (2002) Cross-industry standard key to eCollaboration success, *News Release*, Ticona, Philadelphia.

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