

TINKER, TAILOR: INFORMATION SYSTEMS AND STRATEGIC DEVELOPMENT IN KNOWLEDGE-BASED SMES

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Abstract

Small and Medium Sized Enterprises (SMEs) can experience difficulties in adopting Information Systems (IS) and aligning them with their strategic development. Using the concept of bricolage, an improvisational approach that allows learning from concrete experience, we explore IS adoption and organisational change in two SME case studies. The case studies cover IS rationalisations and innovations and small- and large-scale change over a four year period, and highlight the roles of different actors, internal and external to the SMEs. We find that bricolage is a useful concept as it deals with the need for SMEs to learn about the possibilities of IS in situ, simultaneously exploiting the can-do approach that can be found in many SMEs. However bricolage needs organisation space and the possibility for trust to grow between end users, developers and management as visions are explored and revised.

Keywords: SME, bricolage, strategy, information systems, systems development.

1. Introduction

Information Systems (IS) adoption in small and medium sized enterprises (SMEs¹) has been understood by exploration of both the barriers to adoption and the common elements of successful IS implementations (Ballantine et al. 1998). Barriers identified include financial constraints (Foong 1999), lack of strategic planning for IS adoption (Levy et al. 2001) and lack of in-house expertise in IS (Ballantine et al. 1998). Much of this work focuses on how Information Systems Development (ISD) approaches and strategies used within large corporations can be adapted for use in the SME context.

Two factors tend to call this assumption into question. Firstly, SMEs have specific strengths that can give them a competitive edge over larger organisations, SMEs are renowned for their ability to innovate, to respond rapidly to changing environments and to satisfy customers' emerging and evolving requirements yet these attributes are rarely exploited when SMEs implement IS. Secondly, SMEs engage with IS in a piecemeal way (Ballantine et al. 1998; Foong 1999), stretch IS to support administrative functions that were outside of the application's intended remit (Foong 1999), and allow internal non-IS specialist staff to develop bespoke applications (Taylor et al. 1998). An early exponent of such improvisation was Karl Weick who recommended emergent design for organisational change that focused more on reflective sense-making than on planning and prospective decision-making (Weick 2001). Such tinkering in organisational innovation and change is termed bricolage and IS innovations can feature a '*bricoleur*' who uses the technology tools at hand to craft and re-craft IS artefacts, exploring technology to identify potential new uses and attempting to extend the boundaries of technology use (Ciborra 2002).

In this paper, we begin by reviewing the literature on SME IS adoption, then introduce workable strategies for IS adoption that allow SMEs to gain the benefits of innovation whilst retaining a manageable IS infrastructure via the processes of bricolage and reflection. Finally we present a model to support these twin processes that has emerged from a comparative analysis of two SME longitudinal case studies of IS development and integration in the period between 1999 and 2004.

2. SMEs Perspectives on IS

The archetypal image of an SME is of an organisation that it is often short of cash, operating within a focussed marketplace and reliant on a small number of customers. Factors that influence their adoption of IS may be internal - socially, politically or artefact dependent; or external factors e.g. the business climate, external perception of an organisation and necessary interfacing mechanisms with clients (e.g. adoption of Electronic Data Interchange). Such characteristics influence the decision making processes, strategies are often short term in nature and determined by funding, managerial perspective and skills available to the enterprise. We have synthesised the literature into a pragmatic schema of adoption factors that are recognisable to an SME IS practitioner and to which they can relate. The challenge is to turn characteristics that have traditionally been inhibitors into levers to gain competitive advantage. We examine the characteristics of personality of the creator, cost and strategic relevance.

2.1. Organisational Characteristics

Most SMEs reflect the personality of their creator (Atkinson et al. 2004), who typically employs a directive form of management within a shallow hierarchical structure, personally determining the ethics, recruitment, working practices and structure of the firm, as well as controlling financial resources and business decisions. Hence, the interest, knowledge and enthusiasm of the owner-manager tends to drive SME IS adoption (Peppard et al. 1999). IS may be seen as a burden rather than an opportunity, and, if no technology strategy or vision can be communicated to stakeholders

¹ The revised European Union definition, used for EU statistical comparisons, defines a small enterprise as one with fewer than 50 employees, and a medium enterprise as one with at least 50 but under 250 employees. Large enterprises have 250 or more employees. Junnarkar, S. "Venture firms focus on business-to-business e-commerce," CNET News.com, 1999.

(Luftman et al. 1999), then successful IS adoption is unlikely (Reich et al. 2000). Whereas larger organisations exploit the falling cost of IS, SMEs still tend to view IS purchases as a drain on resources, with only the more visionary owners looking to IS as an opportunity for business growth (Levy et al. 1997). SMEs' reluctance to employ tactical or strategic IS specialists, either in-house or on a consultancy basis (Chapman et al. 2000), may relate to their lack of knowledge of IS or result from a previous IS 'mis-sale' (Igbaria et al. 1998). Cost focus can result in the adoption or adaptation of affordable technology that gives a greater immediate financial return (Foong 1999), yet may result in staff training on the use of purchased IS not being a priority (Lange et al. 2000).

The benefits of aligning IS strategy with the business strategy are well documented and are key to the conversion of IS from a cost to an investment with a reasonable Return On Investment ratio (Levy et al. 2001; Venkatraman 1994). However SMEs tend to react to immediate pressures, relying on instinct and intuition (Burns 2001; Junnarkar 1999) implementing IS in a fragmented, cost driven fashion, and applying them predominantly to operational and administrative tasks, rather than as a strategic competitive tool (Ballantine et al. 1998; Foong 1999). For example, SMEs have been driven by perceived social pressure to join the Internet party (Riemenschneider et al. 2003) and are cautious about investing in integrated website and back office e-business solutions failing to see a significant business benefit to such an approach (Poon et al. 1999). This failure to change their underlying business models to take advantage of potential new IS enabled revenue streams (Keindl 2000), has reinforced SME caution towards Internet adoption, to the extent that SME Internet connections, number of web sites and acceptance of online orders have fallen significantly (DTI 2002).

2.2. Bricolage and Systems Development

The increased pace of the business environment has meant that even, for large scale ISD, the use of all stages of a software development methodology has become a luxury (Fitzgerald 1997). For example, Rapid Application Development (RAD) and eXtreme Programming (XP) has allowed small teams to develop systems quickly in the face of rapidly evolving requirements (Beck 2000; Martin 1991). Furthermore, the move towards packaged software, outsourced software development and the combination of bespoke and 'bought in' or open sourced software components creates development scenarios not addressed by formal software development methodologies (Russo et al. 2001).

With this change in the ISD landscape the notion of the 'bricoleur' developer has re-emerged, the handyman who uses tools and materials at hand to accomplish a task, the early bricoleurs were end users who developed technology to support specific needs, classic examples including American Airlines SABRE and the World Wide Web. Recent, higher level applications have resulted in the re-emergence of the new 'bricoleur' who interacts with software in a use context, redesigning existing parts, adding new functionality and exploring new ways to utilise the technology from the concrete perspective of 'use' of software. End users play a key role through the co-construction of emerging requirements with the developers, and in the choice and exploitation of package software. This bricolage approach can be observed within open source software (OSS) communities (Feller et al. 2002), where users and developers work together to generate alternative requirements and try them out rapidly with 'better tinkering' to the code, i.e. those acceptable to developers and users, emerging as semi-permanent changes to the software. The notion of bricolage runs counter to established ISD methodologies where identifying the IS vision follows directly from a declared business strategy, and where planned and managed development is seen as important. On the other hand, the intimacy between user and developer exhibited in ISD bricolage resonates with Mitchell Kapor's Software Design Manifesto, first delivered in 1990 at Esther Dyson's PC Forum, and which included the following metaphor for design:

“What is design? It's where you stand with a foot in two worlds – the world of technology and the world of people and purposes – and you try to bring the two together.” (Kapor 1996).

3. Strategic and IS Development

3.1. Vision

Classic strategic IS development is seen as aligning the IS demand with the (pre-existing) business strategy, a core constituent of which is '*vision*', a shared and agreed concept of what the business will be in future, and how it will operate. That innovation is business-driven rather than technology-driven is seen as a critical success factor of IS strategy (Ward et al. 1996). We refer to this forward-looking vision process as '*envisioning*'. The alternative approach of bricolage is where tinkering activities in organisational innovation and change contribute to an emergent organisational design, guided by a minimal amount of pre-composed material, and making a significant use of retrospect – '*a little structure goes a long way*' (Weick 2001). Weick asserted that in order for bricolage to be successful those involved need to know the resources, listen and observe, trust their ideas and to benefit from feedback loops that allowed for learning and correction (Weick 2001). Strategy formation via bricolage occurs when tinkering overcomes the cognitive barriers that impede innovation, and an innovative project retrospectively becomes of strategic importance (Ciborra 2002). Innovation is a social process that is mediated by the social network that determines the viability of the proposed innovation (Edwards et al. in press), and we recommend a bricolage approach to the innovation process from which strategy can emerge, facilitated by a '*re-visioning*' process where management, involved users and bricoleurs look backwards in order to look forwards. They reflect on an innovative IS development activity that may not have been part of the previous '*vision*' and are able to incorporate their learning into a new view of the future.

Bricolage of IS is not without its dangers: the entropy of the IS can increase as changes are made, rendering the IS architecture unmanageable and inefficient. Recent writing on IS architecture and vision have helped our understanding of when SMEs should be '*envisioning*' and when they should be '*re-visioning*'. An architectonic approach is beneficial in that it gives a '*guiding image*' or '*parti*'² vision to the design proposal that creates an overall structure for the IS (Stolterman 1999). In contrast, a tectonic³ system has some basic functionality and application area without a rigorously predefined goal but is designed in such a way that it may be constructed over time (Stolterman 2000), cyberspace being an excellent example. The difference is one of scale and speed. Even small-scale innovative IS development can have an initial concept but we agree with Weick's view of the power of the minimal structure. Learning from the small scale helps the organisation to '*re-vision*', and contributes to a new, minimal guiding image for the large-scale view of the business and where it is going. This guiding image will also be stimulated by internal drivers (efficiency gains, process support, inventory or financial reporting) and external drivers (market conditions, technological advances, salesmanship or customer demand). What is important is that the SME can learn about new opportunities and past performance and implement change fast enough to compete technically with larger competitors.

3.2. Actors and Roles

Key actors in this drama are systems developers who can be internal or external to the organization (examples of externals include consultants and technology vendors), management and end users. We are interested in the roles these actors can play in IS adoption that contribute to positive organisational change. All roles can contribute to bricolage and organizational '*re-visioning*', also these are roles rather individuals as the same person may take on more than one role, particularly in an SME.

Systems Development may be driven by an internal champion, an external actor or internal and external actors working together. External intermediaries are rarely considered by SMEs yet their role can be key. Illustration of the utility of externals in helping SMEs '*re-vision*' is highlighted in the Quick Scan approach where consultants and technology vendors support SME managers in developing

² The '*parti*' concept is founded in architectural design where, historically, '*parti*' images or plans of theoretically well structured buildings could be drawn upon when designing new buildings.

³ Tectonics means "the art and science of construction or building" Hanks, P. *Collins Concise Dictionary Plus* Collins, London & Glasgow, 1989.

strategic self-descriptions that may highlight the need for innovation (Vos in press). SMEs have a well documented wariness of externals, seeing technology goods and services as commodities 'sold' like other purchases, with cost as the overriding consideration. However, externals can be key actors in the development of both an IS and business strategy. The strategic external will aim to build long term relationships from which they can deliver a variety of goods and services to the SME. The opportunist external will look for a 'quick win', offering a one-off product or service.

Managements challenge is to balance the need to maintain current business performance against spotting innovations that will open up future business opportunities. Monitoring of business performance can identify the need for rationalisation of IS. Whilst small-scale bricolage can be a process by which management become alerted to innovation opportunities, possibly provoking re-alignment of IS and business strategies. End users are crucial in bricolaged ISD as a source of requirements and ideas. They may have recent external experiences, if they have been employed in another organisations and can bring an alternative perspective to the typically, inward facing SME.

3.3. IS and Business Innovation

In knowledge-based SMEs, there is an increasingly symbiotic relationship between business and IS innovation, knowledge-related innovations are likely to involve IS and IS innovations are likely to impact on the business process (see the fuzzy line between them in Figure 1). An SME may engage in an innovation to keep pace with, or differentiate themselves from competitors. The innovation may be an improvisation using tools that are already in use. Alternatively the innovation may be a small-scale

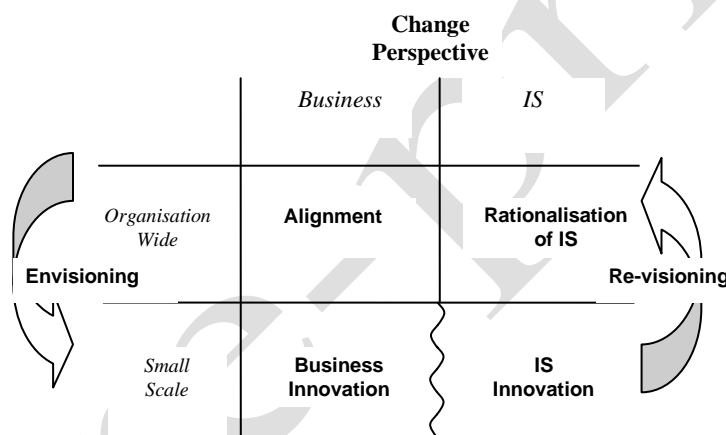


Figure 1 - Vision and Change

radical change involving a bricolage approach utilising whatever resources are cheap and to hand, but one that opens up new possibilities.

3.4. Rationalisation of IS

IS rationalisation is an entropy-reducing activity that allows business processes to be realigned, data to be cleansed and integration of hardware or software platforms to be improved. We show this in **Error! Reference source not found.** as a subsequent activity to re-visioning provoked by innovation. The motivation for rationalisation may be efficiency or cost gains, or to increase scale and mechanization, perhaps leading to time saving; or an improved product or service. This can then become the basis for differentiation, where the customer is willing to pay for a different, higher quality product or service. Specialisation is part of this strategy of enhancing a company's profile during technological development (Guimareaes 2000). Rationalisation can be seen as a form of standardisation that creates the paradox of allowing SMEs to compete by reducing their distinctiveness (Katz et al. 2003). Dierckx recommends the trajectory of increased standardization, followed by differentiation and specialization, for SMEs to enhance their profiles in a period of IT development (Dierckx et al. 1999). IS rationalisation is an expensive venture whose timing can be critical to a cost-sensitive SME.

3.5. Alignment of IS and Business Strategy

The turbulence that accompanies re-visioning and rationalisation may stimulate a broader look at the SME's future. As management gain a better understanding of the possibilities of the recent innovation, they may be ready to build on that and the rationalised IS infrastructure to create a new business vision, to 'envison' new opportunities for business/IS innovations. By representing the relationships between vision and change in a matrix structure we are deliberately moving away from the more traditional use of linear models to explain SME IS adoption and innovation activities. Such linear models risk oversimplifying complex issues and fail to highlight pertinent processes that may take place at the micro level (Martin et al. 2001). Recent studies have shown that SME IS adoption does not follow a linear path but is dependent on an SME's strategic focus (Levy et al. 2001). Furthermore, while some SMEs may seek to standardise (or rationalise and align) their IS, others remain rooted in a tectonic approach. Although a linear model is attractively simple, a more flexible structure that recognises the influence of market conditions on the SME approach to IS adoption and development is a more realistic model.

4. Case Studies

The two case studies identify contrasting models for adopting IS within SMEs. The first case study provides an example of an ISD subversively driving the SME's strategic agenda with positive results whilst the second SME rigorously followed 'best practice' in the development of an integrated IS infrastructure but failing to meet its strategic objectives.

4.1. Case Study 1 - Pets Monthly

The first research study (CS1) focussed on a small partner-managed SME operating in a niche market of national and international magazines, books and videos for pet enthusiasts. Employees are full time staff and freelancers who provide support at international shows (mainly journalists but also contract sales staff). They have one UK and many overseas competitors, all are owned by major publishing houses. We report on the subversive development of two IS projects, a bespoke Customer Relationship Management (CRM) system for advertiser accounts and a market leading web-based portal. These systems have improved company efficiency and created a more professional, international brand image. Better customer relations have been established and an increase in international advertisers, subscribers and contributors has ensued. The technology has also improving the working lives, and morale, of employees. The company is now the clear international market leader.

4.1.1. Vision

The company's aim was to increase circulation and advertising revenue while minimising costs. During the study ('99-'03) their strategy was high profile attendance at most international shows and aggressive sales staff management, they did not consider strategic IS development or growth. The IS vision was developed by an internal employee and an external actor, their vision grew from a CRM system to a comprehensive e-business site differentiated from the existing printed media.

4.1.2. Rationalisation of IS -Bespoke Advertising Booking System

The company's ISs were fragmented. There was no systems integration (advert processing, accounts, editorial etc.), and no memory of retail bookings. The first proposal for a bespoke soft/hardware development for £26k was rejected on the basis of cost and perceived rapid obsolescence. A revised quotation of £16k for a system with reduced functionality was also rejected. In an attempt to engage management, end users undertook a detailed cost/benefit analysis highlighting both financial and intangible benefits, following which the project was given the go-ahead. At the time of writing the system is still successfully in operation and now allows customers to input their own adverts online.

System developer input came from an external actor, the Sage accountancy software salesman who understood how the company worked, was contracted to provide IS 'trouble shooting' services and was well known to staff. Iterative prototyping was used, this allowed end users to incremental

identified additional functionality that was added to the evolving system with no cost implications. Interestingly, the requested functionality was largely concerned with monitoring and control

Management were coerced into investigating the possibility of implementing new technology. Their conservative view was that existing processes should be replicated in the new system. However, as a result of the iterative improvisational development approach, management were not aware of the divergence from a replication approach until well into the system's development.

End users identified the need for new IT/IS to remove replication of effort that was inherent in the current systems and to improve security with regular backups. They were heavily involved in requirements gathering and, through exposure to ongoing prototypes, contributed to the development of the on-going ISD activity although the level of involvement was not obvious to management.

4.1.3. IS and Business Innovation - E-commerce Website

By mid '00 the company's web site was a single page with company contact details. Advertisers wanted email copy submission and a cursory analysis showed competitors had larger, but still static, web pages. Management were reluctant to embrace e-commerce, but agreed to support a preliminary implementation, internet connections were installed and Macromedia Dreamweaver and Actinic e-commerce software were purchased. To get a 'quick hit', the developers immediately introduced e-mail to enable customers to electronically deliver copy, uptake of this service was rapid. To act as an exemplar the business's mail order service went online first. New features were incrementally added; including 3rd party directories, an event calendar, news and regular features that were also available in the newspaper. Promotion was by viral marketing and use of their URL in company publications, hit rate increased to c.10k per month. Phase two saw e-publication of the entire paper weekly and access by subscription. Freelance journalists were able to submit their copy online. This, and maintenance of the site, needed a full time web designer, this was agreed with the second phase going live on Jan 1st '02. In '03 the site recorded 50k unique hits per month with revenue of c. £30k annually.

System developers were the internal end user and a different external actor, the contracted IT maintenance engineer whose company were offering free web hosting services in anticipation of longer term financial gain. He trained the internal developer and they created the site collaboratively. Their covert goal was to make most of the site available only to subscribers, by not stating this explicitly management saw it as 'commercial distraction'. They did not release the internal developer from all of his usual work nor did they pay the external actor for his services.

Management were concerned that the internet development was a distraction in terms of staff time, viability of long term maintenance and an unsustainable e-commerce based business model. Their attitude was cautious, agreeing to limited budgets and scepticism regarding concrete achievements.

End users were engaged and informed and learned more about the possibilities of ICT by education from their peer, the internal developer and the external actor.

4.1.4. Alignment of IS and Business Strategy

The ad hoc nature of the IS development has resulted in an urgent need for systems update and standardisation. A revised ICT infrastructure is now needed to allow for interdepartmental functional integration; a single database will improve efficiency and deliver a management IS; and Web content management should be devolved to department level. Interestingly, there is now management commitment for this, based on the concrete experience of the first two developments.

4.1.5. Reflection – Supporting Bricolage

The bricoleur, whether internal or external, needs organisational space in which to innovate and experiment. Internal bricoleurs may already have a vision, but need flexibility and management support if the vision is to be owned by the SME. For external bricoleurs this means establishing trust, divulging strategic plans, attending technology demonstrations/product launches and promotion events and giving time to increase decision makers' technology literacy, the decision maker must be equipped

with at least a broad understanding of technology to enable meaningful communication. SMEs are renowned for being inward facing yet external parties can be exploited. In CS1 no time was given, but management support was forthcoming. Limited technical dialogue with management occurred but 'trust' meant that they were prepared to learn by example. Significantly, the external bricoleur was the 'envisioner', they were given free access to strategic plans and became the 'vision' driver.

A key requirement for stimulating internal bricoleur vision is some diversity of technology. In practice, at the early stages of technology adoption SMEs tend to purchase in an ad hoc fashion, this diversity during initial technology adoption can be a positive strength, a willingness to adopt various hardware and software solutions, usually to satisfy immediate requirements often stimulates a 'can-do' culture. In CS1 technical diversity was encouraged, software for developmental purposes was purchased, from a management perspective, with no regard for future rationalisation. The bricoleurs had a long term vision of business/IS alignment but for 'proof of concept' did not consider alignment.

Organisations need to exert some control over the innovation process, however, if they are not aware of bricoleur activity controlling and learning from the process is difficult. Whilst control is desirable, an element of self organisation will take place – weaker elements will be discounted, responsible bricoleurs will practise some degree of 'self selection'. So, the support that management can offer during innovation is flexibility and a level of autonomy for bricoleurs, coupled with some mechanisms for control, e.g. cost/benefit analysis from the bricoleur, financial limitations on resource spend or time constraints in terms of number of hours bricoleurs can work on the innovation activity. In CS1 the bricoleurs were given flexibility to develop systems within tight time constraints and management 'bought in' to the bricoleurs' 'vision' following a detailed cost/benefit analysis prepared by collaboration between the external bricoleur and end users. It is key that SME management recognise the potential value of bricoleurs and take steps to protect what may transpire to be one of their greatest assets. Rationalisation of an innovation with existing products and processes requires end user input, they hold the in-depth knowledge regarding the products or processes with which rationalisation should take place and should therefore lead the activity. In CS1 the end users drove the rationalisation process, stakeholders from different departments collaborated to drive the rationalisation forward.

4.2. Case Study 2 - JobCo

The second research study (CS2) is an SME which provided recruitment-related services for large multinationals. The company employs full time staff and independent consultants to support specific projects. They have 3 direct international competitors; the company's perceived competitive advantage is a quality, personalised service. Management instigated two IS projects, a packaged CRM system for client accounts (to implement this simultaneous integration of the IS infrastructure needed to occur) and a web-based portal to provide a collaborative virtual space for clients and consultants. These implementations have only been partially successful. The business/IS strategies are more aligned however initial enthusiasm has retreated to a more reactionary approach spurred on by competitor action, already purchased software solutions are not being implemented, staff are demoralised and alienated, the company's brand image is in jeopardy and they are losing market share.

4.2.1. Vision

The company's aim was to improve productivity and profitability whilst maintaining its high quality, personalised image. During the study ('00-'04) they expanded rapidly across Europe. With this expansion the strategy has been to implement integrated ICT, what the management term as 'world-class systems'. Management believed ICT-enabled monitoring of client accounts can facilitate quicker account turn-around, increasing cash flow. During the study, as technology 'moved on' management's vision extended to include a web-based portal where clients and consultants could interact. Full-time graduates were appointed under the joint supervision of the company and the university.

4.2.2. Alignment of IS and Business Strategy

The route to a pan-European, 'world class' ICT infrastructure was not clear. Initially, the company's inter-site networking and Internet access was limited. End users were using Apple Mac technology,

developing and evolving the IT systems on an *'ad-hoc'* basis, whilst this created scalability and compatibility problems the organisational culture was very much *'can-do'*.

System developers were the external university actors who worked with managers to develop a phased *'roadmap'* to align IS and business strategies. At management meetings the external actors presented a review of the ongoing alignment process and facilitated an *'envisioning'* session, external actors and management discussed how emerging IS developments could be utilised in a future integrated business/IS strategy. Management were cost aware but willing to invest in IS, viewing it as a prerequisite for a competitive European company. They recognised that the company did not have in-house IS expertise and saw external actors, both academic *'strategists'* and technology suppliers, as a logical solution to that skill shortage. End users were not involved in this alignment process.

4.2.3. Rationalisation of IS – CRM System

The IS systems were fragmented; a phased rationalisation approach was adopted. Firstly, a new network of PCs with MS Windows, MS applications software, and managed storage and communications protocols was implemented. Secondly, an in-depth requirements and software evaluation process was undertaken to procure a packaged CRM system that would be the core of an integrated company database.

Systems development was undertaken by a university employee seconded full time to the company, they installed the new network, new hardware and software, and provided ongoing IT support, thus developing a close working relationship with management and end-users. This internal actor was supported by an external technology and services provider who was the network vendor and provided ongoing external helpdesk support. Due to their close working relationship, the technology vendor provided informal training to the internal actor who subsequently brought those skills in-house, disseminating them throughout the organisation. Management supported the development strategically but disengaged operationally. The purchase of a packaged CRM solution was a substantial investment, yet paradoxically additional, small scale funds for the supporting network were not forthcoming unless the company could be shown to already be lagging behind competition, hardly a sign of a *'world class'* system. End users collaborated in the specification of the new CRM system, resolving data anomalies and reporting inconsistencies. They were provided with training opportunities but many months before the system was released as the training budget was allocated to a specific year's accounts, and implementation was delayed for financial reasons.

4.2.4. IS and Business Innovation – Client Portal

The company envisaged a collaborative virtual environment style portal that could move them into a new market sector, the direct management of individual client career portfolios (CV management, position spotting, career development and networking skills seminars etc). However the implementation was repeatedly put on hold, the belief being that development of the portal could not go ahead until the CRM system was in place. Over time competitors launched sophisticated portal-based sites and staff became IT *'disengaged'*, in recent months an internal actor who is responsible for identification of marketing opportunities has begun to *'champion'* the portal project.

Systems development was initially undertaken by another university seconded actor. Relationships between this systems developer and the owner manager broke down. The owner manager wanted the system developer to concentrate on existing systems support activities until the CRM system was in place whilst the systems developer wanted to stick to her remit of developing a portal site. Repeated prototype portals were developed but were ignored by management. The owner manager ceased to take a strategic view, preferring to adopt a fire-fighting approach to IS. The owner manager's perspective *'closed'* being no longer prepared to *'envisage'* a longer term innovation. Interestingly, when driven by external competition and *'envisioning'* from a trusted internal actor the portal implementation has recently regained momentum.

End users, be they internal or external, were not consulted in the innovation process; this was despite repeated requests by the external university intermediaries to involve clients, consultants and end users in early brainstorming activities.

4.2.5. Reflection – Supporting Bricolage

Bricolage inevitably entails a degree of entropy. Whilst management may acknowledge this in principle, if a directive form of management exists it can be difficult to support in practice. To succeed, management must become less directive and more collaborative. In CS2 management were theoretically open to high level '*envisaging*' yet did not understand detailed technical issues necessary for practical implementation to succeed. A '*sales resistant*' approach to external bricoleurs existed; they were not trusted, making long term partnerships difficult. The strategy bricoleurs (the university academics) were used for reinforcing the owner manager's belief that he had utilised external expertise but operational plans were restructured when management were required to relinquish some control.

For the internal bricoleur, to allow IS innovation to occur, access to technology is required. Internally such access includes purchases of new technology or access rights to existing technology to allow exploration. Access to education on technology trends is also beneficial, for example attendance at promotional seminars or training courses. Crucially, it is the external bricoleur who can provide access to such technology and services by provision of evaluation or beta software, notification of promotional and training events. Again, it is essential that the SME has established a good rapport with the external bricoleur, the internal bricoleur and the organisation as a whole may be travelling though a steep learning curve, taking on new concepts and ideas. Having external support that can act as an independent '*sounding board*' can be beneficial. In CS2 management utilised their access to external '*envisioners*' yet were reluctant to involve end users. Access to external bricoleurs occurred out of necessity in their service provision role, rather than seeing this as a strategic partnership. Management were not prepared to acknowledge the value of the training and bricoleur advice being provided to the internal system developer. In CS2 an historical '*can-do*' culture was quashed by removal of access to technology for *ad-hoc* purposes, staff alienation occurred as end users were not allowed to contribute to the development of an aligned business/IS strategy.

Trust and flexibility are required for successful bricolage development. In CS2 very limited scope for bricoleur activity was allowed. Management had a very linear view of systems development and were not prepared to consider additional development activities until previous IS initiatives were firmly bedded into the organisation. The internal bricoleur was not trusted and management structures were put in place to monitor and control the bricoleur's activity, the very nature of this control stifled innovation. This has resulted in the two internal bricoleurs leaving the organisation, the external technical bricoleur has been replaced purely on the basis of cost and the external '*envisioners*' have declined further consultancy opportunities with the organisation. The company has returned to its isolated, introspective approach.

If the innovation is to be adopted then rationalisation with the existing IS infrastructure is required. There are cost implications to such rationalisation (time involved in system analysis work, cost of new hardware or software licences, training overhead etc.). A further challenge for the SME manager is to appreciate that perfect rationalisation may not be possible or desirable. There is the temptation to look for perfect rationalisation with no redundancy before allowing the next phase of development to occur. In CS2 rationalisation process started as a systems analysis project but evolved into system paralysis, the project plan was completely linear, no additional activity was allowed until the current phase of the project was '*world class*'. This approach resulted in the company slipping further behind its competitors who were releasing additional functionalities that, whilst less than '*world class*' were at least visible.

5. Conclusions

We have developed a phased IS model that aims to support communication with SME owner managers concerning the symbiotic development of innovation via bricolage with the adoption of a strategic view on the application of IS. Theoretical approaches and concepts regarding the adoption of IS have been combined with practical concepts identified by field study. The IS scenario model consists of a vision aspect, a change perspective and 3 actor phases. Building on Weick's requirements for successful bricolage (Weick 2001), we propose the following:

- SME owner managers need to be fully aware of and exploit the resources available to them. In order to do this they need to achieve a level of technical understanding, they need to nurture an organisational culture that supports their staff in the utilisation of their current and potential skill sets. Additionally, owner managers should be open to the external resources that may be available to them, avoid a 'sales resistant' strategy and be prepared to finance purchase of technical resources to support bricolage.
- Observation and listening are essential. Being prepared to listen to 'visions' or external bricoleurs without immediately viewing proposals in term of cost can expose competitive opportunities. Similarly observation of the evolution of competitors or organisations with similar business models can be stimuli for allowing bricolage, the competitive SME needs to be outward facing.
- Placing trust in internal or external bricoleurs is essential, giving trust creates an environment where bricolage can thrive.
- Any bricolage environment needs some control imposing up it. The challenge is to allow bricoleurs to employ some level of self regulation; rigorous control will stifle innovation, whilst no control is financially naïve. Minimal structure and learning via incremental change are recommended.

Aligning the IS and business vision of the organisation to create that 'parti' vision requires engagement across the organisation. Whilst bricoleur activity may be the stimulus that moves an SME towards developing an integrated IS/business strategy or 'vision', such alignment is not achievable unless the whole organisation goes on the journey together. Directive management will struggle to steer this journey, a more collaborative style is required. In CS1, whilst management remained remote they did not direct. The journey leaders were the internal and external bricoleurs and management were open to being led. In CS2, management retained a very tight control. Whilst embracing the 'parti vision' for the organisation that was proposed to them, when a roadmap was put in place to bring about that vision they were not prepared to relinquish control sufficiently to allow constructive bricolage with end user involvement. The project stalled.

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