# A framework for promoting learning in IS design and implementation

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## Abstract

**Purpose** – The purpose of this paper is to set out an argument for a way to design, implement and manage IS with an emphasis on first, the learning that can be created through undertaking the approach, and second, the learning that may be created through using the IS that was implemented. The paper proposes joining two areas of research namely, technology management with soft systems methodology (SSM). The framework was developed through undertaking a customer concern management project within a manufacturing organisation.

**Design/methodology/approach** – Reviewing the literature on information systems management, the learning organisation, and systems theory a proposed synergy is found. The outcome of this synergy allows a number of methodologies to be identified that are argued as suitable for IS design. From these information system development (ISD) methodologies, SSM is expanded to incorporate the principles of the learning organisation and systems theory. The expanded SSM framework is applied in practice through a process of participatory action research.

**Findings** – The outcome of the practical work argues for a complete framework that joins the areas of research (SSM and technology management) and emphasises other thinking from the areas of systems theory and the "learning organisation".

**Research limitations/implications** – The paper concludes with a discussion on the advantages of joining soft systems with technology management but also the limitations created. Such limitations have been identified as moving from the soft, tacit issues of the design phases to the harder more structured aspects of technology implementation and management. A change in philosophy may restrict other issues from being explored. This issue needs to be focussed on in future research.

**Practical implications** – A framework has been developed that draws on the work of soft systems methodology (SSM) and a technology management process framework (TMPF) used in the area of technology management. By expanding the SSM model and joining it with the TMPF an attempt to give individuals and teams a practical tool to help design, implement, and manage IS with an emphasis on learning the framework promotes.

**Originality/value** – The framework provides advantages for academics, consultants and other practitioners and gives a central focus on what issues need to be accomplished more explicitly in order to undertake an ISD project.

**Keywords** Learning organizations, Information systems, General management, Research and development

**Paper type** Research paper

## Introduction

This paper sets out to propose a practical model that organisations can use to develop implement, and manage their information systems (IS). The authors of this paper

develop the practical model using three areas of research, namely, IS management, the "Learning Organisation" thinking and systems theory (with a particular interest on soft systems thinking). The purpose of this model will be, first, to develop a practical framework that organisations can find helpful in designing and implementing an IS. Second, the framework can be used to further develop learning capabilities within organisations through undertaking the design and implementation process.

As a start in this paper, a model has been developed to identify the areas that will be addressed. The area of technology management has been adapted from Phaal *et al.* (2001; 2004a, b, c) on issues of identification, selection, acquisition, exploitation and protection (ISAEP). However, the areas of research that need to be applied (the learning organisation, systems theory and soft systems thinking) have to be joined with the technology management process, to form an overall framework. The issues concerning this paper can be seen in Figure 1.

Figure 1 will be used to structure this paper. This paper begins in the middle of Figure 1, with a review of technology management highlighting the usefulness of the technology management process framework as used by Phaal *et al.* (2001, 2004a, b, c). The paper then turns to the learning organisation and systems theory before arguing for the existence of a synergy between the three areas. From this synergy, the paper focuses upon how IS are being implemented within organisations. From this review it is argued that an expanded SSM framework that has incorporated the thinking of the "learning organisation" and systems theory should be used. This expanded SSM framework is joined with the technology management process framework, to enhance the learning capabilities at the design and implementation stage, and carry this thinking through to managing the technology. This expanded SSM framework has been used within a manufacturing organisation. This case is then discussed followed by how the findings can then be applied to an overall model. The paper finishes by exploring how the findings of the overall model related to the manufacturing organisation.

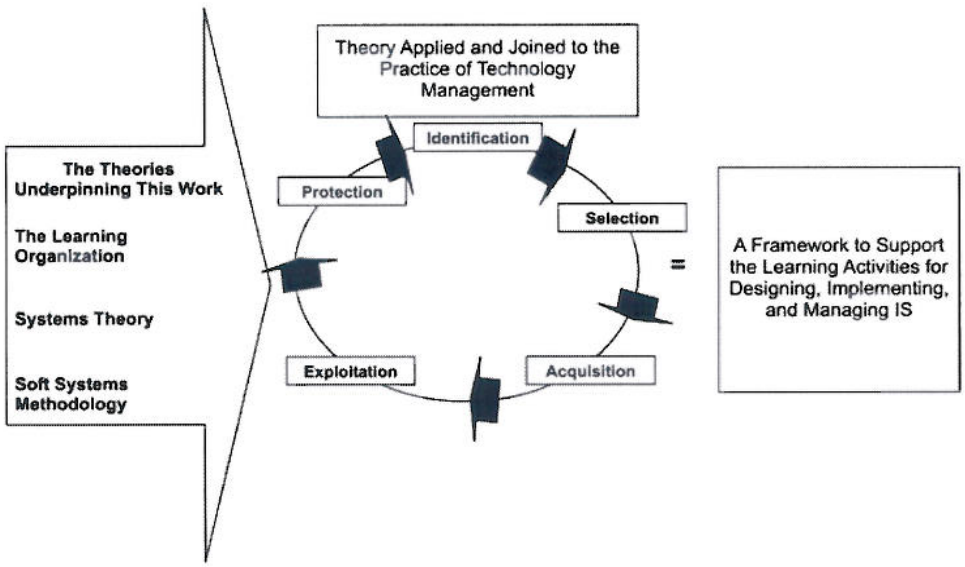



**Figure 1.**
How the technology management process model will be expanded to create a new approach as an encompassing framework that investigates designing, implementing, and managing information systems

## Information systems management

Information systems (IS) are allowing customers to be more selective in the products and services that they purchase from organisations. This change is forcing organisations to meet their current and potential customer's needs, of which IS is also being used to help. Through this focus on IS, organisations have increased their spending on IS (Johannessen *et al.*, 1999). This increase has caused an increase in personal computers along with the arrival of the internet and the decrease in hardware and software costs, which in turn has allowed more organisations to compete with each other more effectively (Thoburn *et al.*, 1999). The whole point of an organisation increasing its spending on IS was to try and become more competitive through innovation (Johannessen *et al.*, 1999). However, some organisations are using *ad hoc* strategies (Currie, 1995) where others are using more formal technology management techniques (see Hackney and Dunn, 2000; Zehner, 2000) as well as technology roadmapping (Phaal *et al.*, 2004a, b, c). It is argued that these *ad hoc* strategies are not providing an organisation with any value, but the use of formal technology management strategies is argued can provide more success. With this perspective of technology management, along with the implementation of IS, that we believe organisations should be placing more focus on.

Management have been noted to take account of IS, and in particular, personal computers (PCs), as a tangible tool that are no different then pens, lights, or other office equipment (Carroll and Perin, 1994). If management take the previous point it may highlight the basis that individuals find difficult in integrating IS within an organisation. Galliers (1995) concurs, as he argues it is well known that an IS strategy relates to the integration of the IS strategy, as well as the implementation of the IS, and the change the technology will bring to the organisation. From her research into the use of IS within a UK bank, Currie (1995) found that an IS project leader's main job was the continuous battle of dealing with day-to-day problems such as the shortage of skills, training needs, restructuring and correcting of faults. If individuals of an organisation can integrate and manage the proposed IS project into the organisation more effectively, the IS may provide the desired outcomes and not be in a constant state of needing attention, while the benefits the technology was designed for can be received. Therefore, theories of the integration of IS need to be addressed.

One answer to this integration problem comes from technology roadmapping as adopted by Phaal *et al.* (2001, 2004a, b, c). Technology road-mapping is labelled as a practical model that individuals within organisations can use to manage their IS. Based on the work of Gregory (1995), Phaal *et al.* (2001) state the technology management process framework (TMPF) consists of five processes. These five processes can be seen in Figure 2.

Figure 2 shows that the technology management process framework consists of identification, selection, acquisition, protection, and exploitation stages. These stages can be described from Phaal *et al.* (2001, p. 117) as:

(1) Identification of technologies, which are (or may be) of importance to the business.

(2) Selection of technologies that should be supported by the organisation.

(3) Acquisition and assimilation of selected technologies.

(4) Exploitation of technologies to generate profit, or other benefits.

(5) Protection of knowledge and expertise embedded in products and manufacturing systems.

While Phaal *et al.* (2004c) refer to technology management in general, Chanaron and Jolly (1999) identify three areas that they investigate are related to the field:

(1) research and development (R&D) management;

(2) management of technology (MOT); and

(3) technological management (TM).

Chanaron and Jolly (1999) state the three areas to be defined by three processes, namely: stakes; stakeholders; and scope. What is considered within the stakes, stakeholders and scope refer to areas within the field of technology management. Therefore, it is important to clearly state which aspect is being focused upon. While technological management is seen to encompass the whole organisation in terms of stakes, stakeholders, and scope as a way to manage all technologies developed, it is the area of management of technology that could be viewed as a suitable process. The management of technology process is where a team can manage a particular technology that is then added to the other technologies an organisation may use and become part of a technological management approach. While the process espoused by Phaal *et al.* (2001, 2004a, 2004b, 2004c) may be identified as a technological management approach by considering the five processes with relation to a single technology, may add value to a project team. Even though this framework has identified a number of processes that organisations should undertake to manage their IS, the field takes a technology as a given. In other words the most suitable technology can easily be identified. What processes organisations undertake to identify an appropriate technology needs to be further addressed. It is therefore proposed that a further two bodies of literature may add value in being used before "identifying" suitable IS. The literature as demonstrated in Figure 1 is the thinking from the learning organisation and systems theory.

## The "learning organisation"

The ability to learn fast is becoming increasingly important in the turbulent dynamics of today's business world. Flexibility, adaptability, innovation, creativity, and the ability to respond quickly to change are the attributes to which successful organisations aspire. An organisation having these attribute could be described as being a "learning organisation". According to Senge (1990), a learning organisation is

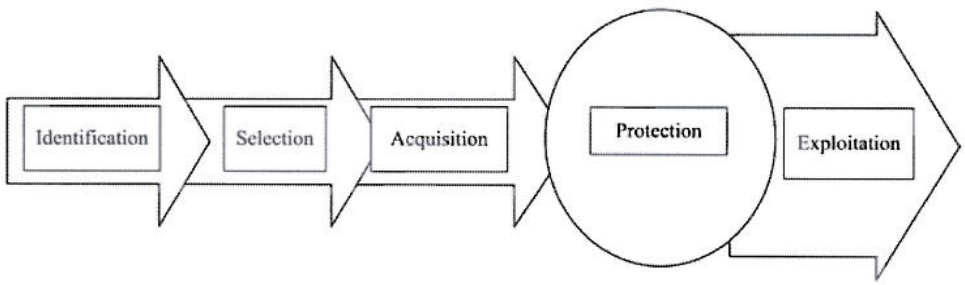



**Figure 2.**
Technology management process framework

**Source:** Venus (1999)

one which is able to tap the abilities and commitment of people to learn at all levels, where people are continuously discovering how they create reality. Similarly, O'Keefe and Harington (2001) and Örtenblad (2001) define the learning organisation as an organisation that supports the learning of all members of that organisation, which can then continually transform itself.

It is clear from the above definitions that "the learning organisation" is looked at as a form of organisation to handle change (Appelbaum and Gallagher, 2000; Garratt, 1987; Lee *et al.*, 2000). This is considered as a major competitive advantage in addition to the usual advantages (capital and technologies) that larger companies easily obtained (de Gues, 1988; Drucker, 1993; Lee *et al.*, 2000; Murray, 2002; O'Keeffe and Harington, 2001; Senge, 1990). While the learning organisation is a form of organisation, organisational learning is learning individuals undertake in organisations (DiBella, 1995).

There are two major schools of thought on how organisational learning is best achieved. The first and perhaps most generally accepted of these, emphasises the facilitation of individual's knowledge, followed by the sharing, and finally the application of this knowledge in the situation of concern. In particular Senge (1990) argues that there are five disciplines that contribute to the features of organisational learning:

(1) *systems thinking* – greatest understanding is gained by examination of the whole phenomena rather than looking at the individual parts;

(2) *shared vision* – ability to bind people together around a common identity or sense of purpose;

(3) *mental models* – ingrained assumptions or ideas that influence how the world is viewed or understood; learning occurs from challenging and re-examining mental models;

(4) *personal mastery* – ability to be enthused and stimulated by your own learning; pit requires a never-ending creative and exploratory attitude to work and life;

(5) *team learning* – ability of the group to achieve more than the sum of its parts (with regards to learning and knowledge creation).

It is clear from the way in which these disciplines are described that whilst the individual has a primary role, implicitly the organisational culture, context and practices all have important contributions to make.

The second school of thought has a different emphasis. It focuses on the ability of the organisation as a whole to generate "appropriate behaviour". Organisational knowledge can be thought of as a capability for effective action in the context where it is required (Maturana and Varela, 1980).

The differences between the two schools of thought are perhaps best reflected in their perceived aims. The aim in the first is to identify those key factors that influence organisational learning and, thus, prescribe the requirements for a series of organisational features. In contrast the second school of thought considers that the organisation exists as a network of interactions, whose purpose is to ensure the maintenance of a structural coupling with the environment. Learning is considered to be the continuous self-development of the network (and hence the organisation) in

order to ensure "continued adequate behaviour". This self-development takes place as part of the process of coupling (Maturana and Varela, 1987).

In practice it is the synergy of both traditions that is the essence of successful organisational learning. The first tradition emphasises reflection and insight on organisational learning on the basis of current understandings in the field. The second tradition provides us with a generic model of emerging a learning capability through the co-evolving the network of interactions and conversations that produce the organisation. The fundamental role of the learning capability is to continuously monitor and maintain, as well as question and change, the pre-understood interactions and the assumptions behind them (Winograd and Flores, 1986).

In conclusion, we suggest that organisations should place more emphasis on "learning" as the way to achieve competitive advantage instead of trying to create a description of a learning organisation either with or without the use of IS. This learning can be used to design IS, which in turn may allow the implemented IS to help with the organisations further learning activities and allow that organisation to transform itself and handle any changes the organisation may face more effectively. Lindley and Wheeler (2001) support this point as they see IS as a way to leverage learning activities within an organisation.

The work of Argyris and Schön (1978) on double-loop learning, Senge's (1990) five disciplines, the use of dialogue (e.g. Dixon, 1998; Isaacs, 1993; Pedler *et al.*, 1997; Schein, 1993) along with language development (Krippendorff, 1995, 1996, 1997; Whitaker, 1996; Winograd and Flores, 1986), is very important in creating learning capabilities. The language can also be used to co-ordinate activities within an organisation (Maturana and Varela, 1980), but is also used to create a shared view of the same system (Senge, 1990). Senge (1990) argues that systems thinking (the fifth discipline) and systems theory is the basis of all disciplines of the learning organisation. We consider it appropriate here to turn our attention to how systems theory could be used as a way to think about and help with the design, implementation, and management of IS as well as achieve conditions attributed to "The Learning Organisation".

## Systems theory

More attention from systems thinking should be placed upon both IS and undertaking aspects described within the learning organisation. By using systems thinking, the whole system under investigation can be examined instead of each part in isolation. However, there can be problems when identifying systems within organisations as well as IS. Checkland (1999) states the term "system", as used by many people is taken to physically exist; however, the term system actually only exists in concept which can or cannot be helpful for making sense of a whole. This confusion has been attributed to the use of language. Checkland (1999) considers that the language used in the implementation of management of information systems (MIS) and other IS is the same as the language that is used in everyday conversations. This can lead to confusion and misunderstanding. For example, Checkland (1999) explains that chemists have specific language so they know precisely what they are trying to communicate when they refer to aspects of the infra-red spectrum. The difference in language causes problems when thinking about "systems" (Checkland, 1999; Lewis, 1994; Stowell and West, 1994; Wilson, 1984). Checkland (1999, p. 48) states that systems thinking has produced a

"meta-discipline and as a meta-language which can be used to talk about the subject matter of many different fields".

Senge (1990) proposes that systems thinking are relevant in undertaking the disciplines he associates with building a learning organisation. Systems thinking as argued by Checkland (1999, p. 49) are, "the concept of a whole entity which can adapt and survive, within limits, in a changing environment." Lewis (1994) concurs as he states you have to look at the whole rather than each part separately. If we are to talk about a "system", an interpretation must be made clear, along with a definition that will make sense as it is related to other explanations (Lewis, 1994; Wilson, 1984). Systems' thinking is an attempt to take account of the concept of "the adaptive whole" (Checkland, 1999, p. 49; Stowell and West, 1994; Wilson, 1984). Checkland's (1999) argument relates to using systems thinking to relate to a specific context, which allows individuals to understand their world and take any actions they wish relating to this context.

If the issues that systems thinking attempts to address, the problems that Lee *et al.* (2000) has noted upon discussing the problems in implementing management information systems (MIS). Stowell and West (1994) suggest the use of systems thinking could be used as the philosophy for information systems. However, with systems thinking there are different areas that can be applied in practice. Therefore, a problem has occurred as simply stating systems theory and applying it in practice could lead to confusion. The areas of systems theory include critical systems theory (see Jackson, 1997), cybernetics (see Beer, 1979) and soft systems thinking (see Checkland, 1999; Lewis, 1994). Jackson (1997) notes the debates between soft systems thinking and hard systems thinking as well the area of cybernetics. Critical systems thinkers debate the areas of soft systems thinkers and so on (Jackson, 1997). While the hard thinkers base their arguments on the body of knowledge generated (Checkland and Holwell, 1998) that the softer and critical approaches lack.

It is the "softer" aspect of systems thinking as discussed by Checkland (1999) and Lewis (1994) for example, that is argued more suitable. This argument can be presented by Bell (1996). The soft approach takes account of a system "as an abstract perception and model relevant to reality"; the structured approach as a system as "a closed and discrete unit of study"; and the functional approach which sees a system as "independent, integrated variables" (Bell, 1996, p. 24). It is the abstract modelling relevant to reality that is of benefit. Investigating IS as a "system" can present different perceptions as opposed to just one universal perspective. Discussing and modelling these different issues is important so a more suitable IS can be designed and implemented. Harder approaches may not allow such a wide variety of perspectives and focus on just one outcome. Or, simply as Lewis (1994, p. 34) states:

> [. . .] soft systems thinking now provides a means of inquiry for dealing with just those messy, ill structured situations which has proved most problematic for the hard systems approaches.

It is this thinking that we examine which can also be an advantage for the management of technology as well as trying to encourage learning organisation conditions. For this to happen the three literatures discussed will firstly need to be commensurated, and secondly, a framework needs to be developed that will allow learning organisation conditions to be developed for designing, implementing, and managing technology as well as allow systems thinking to be used.

## A proposed synergy

The justifications for a synergy between the three areas of literature discussed above are derived form the following. Very few researchers, if anyone, have focused all of the areas discussed when designing and implementing a technology together with the management and strategic aspects. The contribution of these areas will take a wider perspective of how implementing and using IS can be used for the prime purpose of generating learning activities (Small, 2005). Technology management can be used to help implement and manage an IS through the approach espoused by Phaal *et al.* (2001, 2004a, b, c) but the technology needs to be designed first. In order to do this a group, or team of individuals, may undertake this task. However, this group may be a dedicated computer department and design what they believe the users require (Wilson, 1984). From this approach the users may end up with an IS that will not add value to the organisation or to their own learning and development. As one attempt to solve this problem, client-led design (Stowell and West, 1994) is espoused, where the users help design the IS themselves in conjunction with technology specialists. Therefore, the potential users have to learn how to undertake this design which learning organisation conditions can help with. However, no complete framework has been developed to help individuals undertake organisational learning or generate the conditions that have been attributed to the learning organisation. While there is a lack of a clear framework, the philosophy of systems theory, or more precisely the area of soft systems thinking is proposed as a way to help undertake organisational learning as well as designing, implementing and managing an IS. These areas will be combined into a practical framework that a team could use to undertake IS design and implementation. It is with this framework with which our attention now turns.

## Information systems development

It is argued that for individuals within organisations to implement IS, and add value to an organisation, and achieve the synergy discussed above, a number of issues have to be focused upon. The first issue relates to the participation of individuals who will use the IS to be involved in the process (see Avison and Wood-Harper, 1995; Mumford, 1995; Stowell and West, 1994). The second issue relates to how the IS will be designed and implemented. A number of methodologies exist to tackle this issue (see Avison and Fitzgerald, 1995). Avison and Fitzgerald (1995) review a number of methodologies in their book (see Avison and Fitzgerald, 1995). However, within each methodology exists a philosophical underpinning upon how an IS is considered. As Avison and Wood-Harper (1995, p. 103) state when referring to selecting a methodology, "different methodologies represent different views of the world." Therefore, not all methodologies may philosophically accept that the users of any IS should be involved in its design. The methodologies that emphasise this participatory element include Multiview (see Avison and Fitzgerald, 1995; Avison and Wood-Harper, 1995); Soft Systems Methodology (SSM) (see Checkland, 1993; Checkland and Scholes, 1990; Lewis, 1994; Ormerod, 1995) and ETHICS (see Mumford, 1995; Mumford and Weir, 1979). However, if all of these methodologies listed provide a more suitable philosophical approach they also have to be commensurable with the literatures discussed. Table I reviews the advantages and limitations of the three methodologies.

From the three methodologies (ETHICS, SSM and Multiview) highlighted in Table I, it was considered that the most suitable methodology, that could be expanded to take

into account learning organisation thinking, for designing and implementing IS with an emphasis on learning, was Soft Systems Methodology. First, the methodology is noted as being able to incorporate systems thinking as an important aspect within the methodology but in a way that provides a suitable structure to help individuals explore problem situations. However, the approach is not too structured where aspects that could be should be explored become overlooked. Second, it is argued that the methodology has the capacity to be expanded to take into account the synergy of the three literatures discussed. Applying these theories will allow individual perceptions to be raised within an adjustable cycle, which is also an advantage. Third, SSM allows the approach to be altered to take into account specific situations and individuals who use it (Checkland and Holwell, 1998). Also, users of the framework are able to define their own version of the approach that could be more suited to the particular situation (see Atkinson, 1986). Multiview incorporates SSM within its first stage and ETHICS within its second. Therefore, by undertaking SSM or stage one of Multiview will involve the same process. ETHICS, while being useful is judged not to be able to be expanded to take in further issues as well as requiring time to learn the approach. While this criticism can be held against all the approaches, it is the perception of SSM, as a framework, and not a pure methodology being used to explore problems that

| Methodology | Advantages | Limitations |
|---|---|---|
| Multiview | The use of SSM and ETHICS incorporated into the approach | The time it can take to learn the approach |
| | Multiview is proposed as a framework as opposed to a methodology | The time it can take to undertake the approach |
| | Can be used to implement IS | The change of philosophy from moving from the "soft" aspects to the "hard" structured issues required in implementing an IS |
| Soft systems methodology | Can be used to undertake problems that are not easily defined such as designing and implementing IS | May be difficult to comprehend the modelling approaches |
| | Could be changed to take into account specific individuals and organisations | Individuals may follow the process prescriptively and miss understand the principles of working in mode 1 or 2 |
| | Requires the participation of all users if value is to be obtained from using the approach | No direct link to the implementation of an IS |
| | Could incorporate other thinking | May require a change in philosophy from the soft to the hard |
| | Does not have to be followed in sequence or used as a "pure" type | |
| ETHICS | Users have to be involved at all stages | The number of stages the approach incorporates |
| | Job satisfaction issues are addressed along with organisational and IS processes | The time it takes to undertake the methodology |
| | Takes account of the compatibility of IS with an organisation | The request that all stages need to be undertaken |
| | | The confusion on the exact ETHICS approach |
| | | No feasible way to expand the methodology to take into account other thinking |

**Table I.**
Advantages and limitations of three methodologies that emphasise participation from different stakeholders

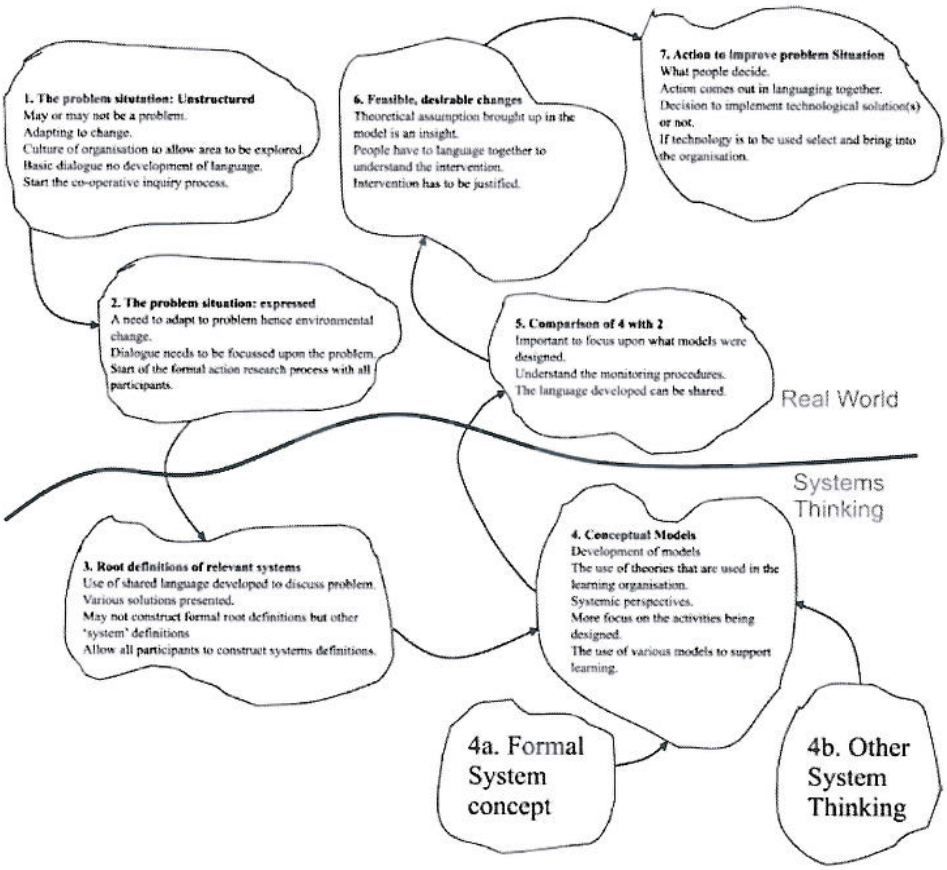
individuals have, that is most appealing, as well as altering certain aspects to suit the situation.

While SSM had been identified, a number of other issues need to be taken into account. The second of these issues relates to the development of language between designers and users of the technology (Small and Sice, 2003, 2004). It is through the development of a shared language and dialogue (see Dixon, 1998; Isaacs, 1993; Schein, 1993) that the many differing mental models (Senge, 1990) can be taken into account and explored. However, all of the ISD methodologies identified above (including SSM) may restrict the formation of language development. Therefore, in an earlier paper by two of the authors of this paper (Small and Sice, 2004), the issue of expanding Checkland and Scholes's (1990) Soft Systems Methodology was undertaken. The purpose of expanding Checkland and Scholes's (1990) work is not to suggest that Checkland and Scholes's (1990) methodology needs to be refined (Small, 2005). The purpose is to help tackle the problems proposed in this paper as well as emphasise greater learning conditions which can be carried into the implementation phase. These issues include: identifying the many differing mental models that a new IS may conjure up, develop a shared language to undertaken the design, allow personal mastery to be developed, allow a shared vision on how the IS will be used once implemented and allow the team implementing the IS to learn (see Senge, 1990). In summary, the expanded SSM framework (see Small and Sice, 2004) will incorporate the proposed synergy discussed in the previous section. By developing the SSM methodology to encompass thinking from "The Learning Organisation" will provide a learning environment to develop solutions to problems that the organisation may face (Small, 2005; Small and Sice, 2004) especially when designing and implementing IS in particular. The expanded SSM framework with these expansions is seen in Figure 3.

Figure 3 displays the expanded SSM framework (developed in Small and Sice, 2004) that has been used within a manufacturing organisation to explore, design, and select an IS. The project was the design and implementation of Customer Concern Management (CCM) technology. The project lasted for a period of approximately two years from exploring the problem situation to conducting follow up interviews on how employees have found using the IS. How the framework succeeded in meeting the aim of allowing learning organisation conditions to emerge needs to be reviewed. Second to this, the participation of the individuals of the organisation, as well as achieving what SSM has been developed also needs to be reviewed. From this practical work, an argument is put for the joining of this framework with the technology management framework. Two aims are hoped to be achieved by joining these two bodies of work. First, if joining the two frameworks can be achieved, a practical framework can be used by organisations to design, implement and manage the IS process more effectively. Second, it is hoped that the framework can be used to implement IS that can be used for generating further learning capabilities.

## The use of the expanded soft systems framework within a manufacturing organisation

The manufacturing organisation was hoping to use a technology solution to record, manage, and solve its customer concerns. The awareness for the project came from an ISO audit. However, instead of implementing a quick solution, the organisation decided to propose a solution that would not only satisfy the audit and customers of the




**Source:** Adapted from Checkland and Scholes (1990)

**Figure 3.**
An expanded soft systems methodology framework

organisation, but would make the employees and hopefully the organisation, more effective in its everyday operations. The individuals' thinking to these concerns can be seen through the work of Ackoff, where in 1981 he discusses resolving, solving and dissolving problems. Instead of implementing any solution to resolve the problem, and pass the audit, the individuals of the organisation wanted to try and solve more effectively customer concerns. Through learning about customer concerns in turn will hopefully resolve customer concerns through making improvements to aspects of the organisations operations.

Individuals of the organisation have an established system for handling product complaints but the quality department undertook this in isolation only. The customer services department was currently responsible for handling the more "soft" tacit customer concerns when dealing directly with customers, but tackles this process in a very *ad hoc* manner. Therefore, through using the expanded SSM framework these and other issues relating to customer concerns were undertaken. Expanding Figure 3, Figure 4 has included the work undertaken at the organisation now dubbed BreathCo (not the organisations real name).

Figure 4 has been designed to be used in conjunction with participants of the organisation in a more co-operative approach to (see Heron, 1999; Heron and Reason,

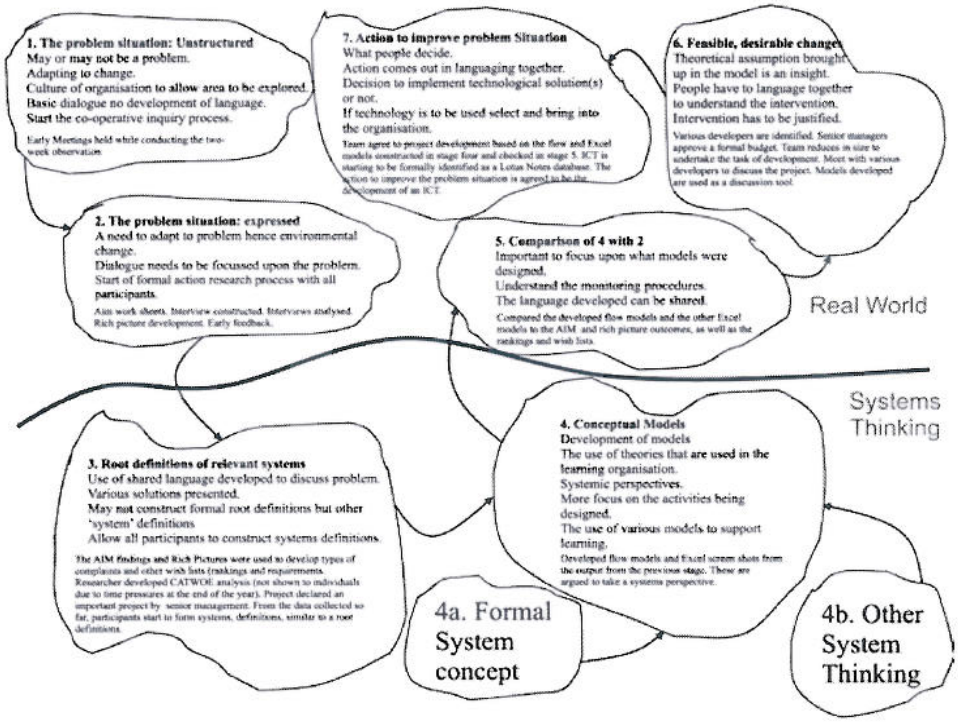



**Figure 4.**
The expanded SSM framework incorporating work from the BreathCo project

**Source:** Adapted from Checkland and Scholes (1990)

2001) exploring unstructured "messy" problem situations (cf. Checkland and Scholes, 1990).

*Stages 1 and 2*

During these stages, the term "complaint" (as it was initially termed) was being explored as to what the term meant to each individual, and the whole organisation. This was the start of a dialogue on this problem area that would lead into the development of a shared language. Therefore, the project team charged with conducting the project along with the first author of this paper had to see if work could be undertaken co-operatively. This issue would see if the "organisation" as a collective would allow change to be undertaken. The researcher conducted interviews, used the appreciative inquiry methods Venn diagrams (see West, 1995), and constructed rich pictures (see Avison and Wood-Harper, 1990; Checkland and Scholes, 1990) at the request of the team. This data allowed comments and debates to be made allowing the problem situation to become more structured.

*Stages 3, 4 and 5*

The outcome of stage 2 allowed modelling to be undertaken as stages 3 and 4. However, the modelling was not that of conceptual modelling that traditional SSM espouses. The modelling took the form of brainstorming from areas that were drawn out of stage 2, constructing flow models (customer contact methods and routes and a

customer complaint code matrix), and designs of how a solution would look visually (Small, 2005). These models were regarded more desirable then focusing the team on constructing formal SSM modelling techniques. Even though at stage 7 action could be taken in using a technology to improve the problem situation, through undertaking the modelling, this thinking was undertaken earlier. Comparing the models to what was undertaken at stage 2, had allowed the team to further develop the language and shape their mental models (cf. Senge, 1990) on how action should be undertaken. It was at stage 5 that senior management decided to rename the project the customer concerns management project, as opposed to complaints. However, the project team perceived that the language and mental models developed were still suitable to proceed, even though concerns may imply a different prospect to the organisation, and the individuals that make up the organisation.

*Stage 6 and 7*

In traditional SSM, stage 6 relates to exploring the feasible and desirable changes through the cultural stream of inquiry to investigate what is culturally feasible and systemically desirable (Checkland and Scholes, 1990). By undertaking the framework through a co-operative emphasis, and the development of a shared language, any changes proposed will meet these criteria. This was because it was a joint team who are involved within the organisation and would not propose any solution that would violate them and other individuals of the organisation, like a researcher or consultant may inadvertently do. On reaching stage 7, action was taken to implement an information system solution based on Lotus Notes. A private company would develop the proposed technology with the IS specialist undertaking a number of prototypes that the project team tested and passed comment on. Before this development stage was undertaken, the advantages and limitations of the framework undertaken so far will now be reviewed.

## Application of findings to BreathCo

The findings from using the expanded SSM framework can be seen in Table II with supporting quotations from the participants involved, but are summarised below:

- The tools provided were simple to use (e.g. rich pictures) and allowed participants to communicate issues about the problem situation.
- The approach allowed the processes to be explored.
- Allowed a more rigorous exploration into the problem than BreathCo would normally undertake.
- Allowed the many tacit issues held by participants to be made explicit.
- Allowed more innovate ideas to be discussed that allowed the problem to be solved.
- Both participants and the researcher gained further insight into other organisational processes.
- The data collected was meaningful to the team as they owned and used the data to construct models which in turn were used to look at specific information systems.

**Table I.**
Advantages and limitations of three methodologies that emphasise participation from different stakeholders

| Advantages | Limitations | Issues not addressed |
|---|---|---|
| The simplicity of the tools used (the rich pictures and the appreciative inquiry method)<br>Example: "I mean I used this for explaining it to my people and it was very easy to explain as well. I mean the visuals on it were great and I wouldn't have been able to do anything like this to explain it to them" (Interview for the Customer Services Manager, January 2005)<br>"[Showing the participant the rich picture and AIM report] it's just so long since seeing this, but yes it was helpful" (Interview fort the Product Performance Manager, January 2005) | Using a full participatory approach could let the project drift from aspects of the framework as well as requiring and satisfying other political issues<br>Example: "Yes I think the way we did it was, as I've just explained by having a huge open forum for input. And what happened there after was the people who were really interested were left at the end. That nucleus was, as I said earlier, was self-selecting. The people who were left were the team, the other people who had fallen by the way side, their input was useful initially, but the core team was left and we said, okay lets do it" (Interview for the Quality Manager and Project Leader's Interview Transcript, December 2005)<br>"Sort of anything that will have to go through them anyway. Anything we decide will have to be okayed by them before anything can be done" (Interview for the Repair Co-ordinator, October 2003)<br>"The customer services manager just asked if I would like complete a form or would I pass it on to somebody else so I just said I'll deal with it" (Interview for the International Team Leader (Customer Services, October 2003) | Due to the time pressures, the organisation was under at the end of 2003 there was no chance to give a talk about the formal use of the soft systems, the root definitions, and conceptual modelling as well as formally presenting the expanded SSM framework<br>Therefore, if these issues were addressed how the project team understood and modelled the system may have been more or less effective and may have enhanced or reduced the use of shared language and other learning organisation theories |

(*continued*)

| Advantages | Limitations | Issues not addressed |
|---|---|---|
| Facilitates the process of exploration<br>Example: Other aspects of language can be explored with relation to more complex issues such as what one participant stated at an early meeting "What is an actual complaint and what is a perceived complaint?" (Researcher Diary, August 2003)<br>Supported in an interview with the Repair Administrator (October 2003) "but its defining what is a complaint, because a lot of people might think a customer getting their goods late are saying it's a complaint, but it might not be your fault anyway, so its defining what is a complaint, and I think its hard". | Time requirements in following the process and learning how to construct the conceptual models and root definitions<br>Example: "I mean from a time point of view nobody in the company had the time so that was something great" (Interview for the Customer Services Manager, January 2005) | A more in depth investigation upon other systems thinking that may have been used. As the organisation is a manufacturing organisation based upon engineering principles other hard systems thinking may have also been used to develop the models |
| More rigorous exploration and analysis BreathCo would normally do<br>Example: "I mean the way it was put together was totality different to anything BreathCo has ever done in the past to the people; it's great I mean. We should learn from this and we should use this as an example for what we do in the future" (Taken From the Customer Service Manager's Interview Transcript, January 2005) | People will only use processes that they are used to using<br>Example: "But I think it's probably since we've gone with the GREAT practice as it formalises the procedures" (Interview for the Customer Services Manager, January 2005) | |

*(continued)*

**Table II.**

Table II.

| Advantages | Limitations | Issues not addressed |
|---|---|---|
| Highlights many different subjective views that move from being tacit to being more explicit<br>Example: "Well one was should we acknowledge receipt of every concern to a customer. I for one thought we should, but our, customer services people didn't. There were a few opinions that lack of understanding, certainly from my part. I didn't understand the commercial aspects of our operations, but once I understood all that" (Taken From The Quality Manager and Project Leader's Interview Transcript, December 2004) | Nobody to ask questions or seek guidance for exploring further use of the framework if used again in another project. The dependence on an expert can be seen through the following examples based on questions relating to help from the developer<br>The quality manager stated, "well he was an integral part of the team." Again discussing the developer "oh yea, a major input into the design of the system" (Taken from Quality Manager and Project Leader's Interview Transcript, December 2004)<br>This is supported by the Customer services Manager "what suggestions I don't know because I don't think we could have come up with it ourselves" (Taken from Customer Service Managers Interview Transcript, January 2005)<br>As well getting support from the researcher "Erm, I think what's nice actually going back to the previous two, having your self involved with it, was a bit different from what we've normally had in the past" (Interview for the 2nd Customer Service Team Leader, January 2005)<br>And "I think because you know computers and you know the systems, and I think with you going around helping other people in other companies, your input was valuable to give us some ideas and obviously directed us how to change things and where to look" (Interview for the 2nd Customer Service Team Leader, January 2005) | Nor revising stages 2, 3 and 4 on changing the title of the project as other processes may have needed to be taken into account even though the project leaders felt the emphasis was still the same and were satisfied with the models produced and the technology that was eventually introduced |

(*continued*)

| Advantages | Limitations | Issues not addressed |
|---|---|---|
| Contributes innovative ideas to solving problems<br>Example: "The project was justified by the fact that we knew people were dealing with issues that weren't being bottomed out. The only thing to do was to capture all the data to do the analysis and attack the route course of the problems. So that was the justification, we weren't very efficient" (Interview for the Quality Manager and Project Leader, December 2004) | | What effect did not going back to show a number of constructed root definition from the CATWOE analysis to the participants and allowing them to construct the models from the AIM outcomes and rich pictures |
| By viewing the problem situation unstructured and helping to structure the problem situation, and using the tools to undertake this task allowed other organisational processes to be brought to the attention of the researcher that may be an issue that all other participants are aware of<br>Example: "Through talking to the sales staff about the re-organisation, an impression was obtained of not being happy with the planned change" (Researchers Diary, August 2003)<br>"The main problem seemed to be centred on purely finding a solution to the problem and not defining or exploring customer complaints" (Researchers Diary, October 2003) | | How removing the co-operative emphasis espoused as being a suitable method in designing an ICT, and using only a participatory action research method that other client led design research states (see Heron, 1999; Heron and Reason, 2001; Stowell and West, 1994) |
| The models and other data that were decided to be collected were meaningful to the team and could be easily communicated<br>Example: "[brainstorming] that was the main tool really, just brainstorming it. Going through process flows, and stuff like that. And I mean it was changed on a number of occasions through the brainstorming exercises" (Interview for the Customer Services Manager, January 2005)<br>"It was just flow charts and things like that. I think it was just from previous designs isn't it, you know, we just, the flow charts wouldn't be much different from other flow charts we'd used" (Interview for the 2nd Customer Services Team Leader, January 2005) | | Flow modelling and screen design models were the only models used. How other participants in another research site would accept the same and different models |

**Source:** Small (2005)

**Table II.**

While all of these points support the positive use of the expanded SSM framework the approach also provided a number of limitations. These included:

- adopting the use of the expanded SSM framework through a co-operative inquiry approach may let the project drift away from the main issues and processes the framework aims to address;
- the time required learning the framework and how to undertake all of the processes may become off putting; and
- individuals may prefer to use approaches they are familiar and competent in using (e.g. brainstorming and flow charting).

While both positive and limitations from using the framework have been identified, the approach overall worked well for this project.

Through using the expanded SSM framework, the design of a customer concerns IS was constructed. In getting to the position of identifying and selecting a solution based on a Lotus Notes platform a number of other issues were identified. Two of these issues included:

(1) BreathCo's operations are sometimes slow.

(2) Individuals having to constantly be reactive to situations.

While it is not the purpose of this paper to explore all of these issues, it needs to be highlighted that first, the value in the expanded SSM framework in drawing out these issues and second, using the approach in the face of these problems. Completing the framework produced a number of models and thinking about improving the problem situation. However, the framework finishes before any IS is implemented within BreathCo. This is similar to other studies using SSM (see Checkland and Scholes, 1990) as this is not what SSM was designed for. Therefore, no framework was used to help undertake this second part of the project. This has prompted calls to expand the approach (e.g. Ormerod, 1995) which this work aims to undertake. It was argued for at the beginning of this paper that a technology management process framework based on the work of Phaal *et al.* (2001, 2004a, b, c) could be used. It is further argued now that the expanded SSM framework should be used to investigate the problem situation of what and how to design and implement an IS, while a team to manage the implemented IS can use the technology management approach.

The remainder of this paper will argue that the approach is suitable as the processes were undertaken within BreathCo even if they were used in a more informal way. Finally, the joining of the expanded SSM framework with this technology management approach in a full framework could add value to the design, implementation, and management of an IS.

## Identifying aspects of the technology management process framework with relation to the BreathCo project

Throughout the project's life cycle a variety of techniques were used to collect the data. However, the main form of data collection method was the semi-structured interview, as it allowed each participants' understandings and personal experiences to be communicated more effectively (Jakobsen, 1997). The data provided to support this paper utilised this method with the four main project team leaders of the project, and

the EDP manager who is responsible for all BreathCo's information technology (IT) hardware and software. In conjunction to using the expanded SSM framework, BreathCo utilise an approach in conducting projects (IS and otherwise) that is labelled here as GREAT. GREAT contains tools that the individuals of BreathCo find useful, and was used in the concerns project to record aspects of this and the first phase of the project. However, GREAT does not show how a project should be conducted, so it is further argued the approaches of identification, selection, acquisition, exploitation and protection (ISAEP) in the framework can add value, specifically for the individuals of this organisation. While this approach is argued as being valuable, Phaal *et al.* (2001, 2004a,b,c) take account that the technology management process framework should encompass all of an organisations technology base. However, with an emphasis on a more structured engineering approach it was argued as not being suitable in looking at specifying a particular IS, which is why the SSM approach was adopted. Therefore, it could be argued that an approach that changes philosophical stances is no more suitable then the methodologies rejected. The technology management process framework is modified to hold true to the philosophy espoused compared to an objective position. In order to achieve this, using just the ISAEP processes for the particular IS designed and implemented, and not the entire organisations technology base, is regarded to be a more suitable approach. Therefore, the project team that undertook the design aspect will be responsible for the implementation and eventual management of the technology. This was the case with the BreathCo project.

It is argued that by concentrating on just these aspects; through a philosophy espousing a client-led approach (see Stowell and West, 1994), the ISAEP issues can be undertaken in a more structured way. These processes will allow enough flexibility for the softer issues that may be present to be explored. From reviewing the data collected from the project, the ISAEP issues were identified to be present with a number of quotes supporting each process from a number of the team members has been placed into Table III. An interpretation and summary of each process is given below.

- *Identification:* This process relates to identifying from all of the IS available, the most applicable. Therefore, based on the modelling undertaken and what is desirable upon comparing models to the structured problem situation, more suitable IS can be identified before "selecting" the most appropriate. For example:

  > There are, every night we run a back up so, the data's backed up every night and we can go back two weeks from the devices we have here. The back up tapes are located in a fire proof safe over the road there, so it's in a safe environment (Interview for the EDP Manager, December 2004).

- *Selection:* Upon identifying a number of applicable IS that are regarded to improve the problem situation, the most suitable has to be selected. By "selecting" requires a project team to make a choice based on issues that are identified to be important to a team which could include cost, ease of use and support for instance. For example:

  > [...] they also demonstrated that, that their prices were very reasonable, for the quality of their goods, they're very flexible, i.e. you could ring them up anytime and they would answer questions. So we judged the supplier based on the work they'd done for us in the past (Interview for the EDP Manager, December 2004).

| Process | Support |
|---|---|
| Identification | "Well let's say SAP; to install this module we want 100K, which isn't unreasonable, cost for them. You've got to look at the benefits" (Interview for the Quality Manager, October 2003) |
| | "Well there'd be logged on some sort of database and, yea could analyse the backside out of them, anytime you wanted it could link problems up and look at it by customer, by product, by region" (Interview for the Product Planner, November 2003) |
| | "I mean I was involved in probably looking at a CAMS system, and there's great similarities between that and SAP, but its pointless moving to a separate stand alone, where we can integrate the whole thing into what we have running currently" (Interview for the Product Performance Manager, October 2003) |
| | "Me and my boss *** [bosses name] have done, started some brainstorming on what we'd like to see on that database and if it can be done. So we've sent that to the quality manager so it should be putting something in place at the beginning of next year for us to go into it" (Interview for the Purchasing Employee, December 2004) |
| | "So we had a SAP consultant in and we also looked at three "off the shelf" software packages that handle customer concerns stroke complaints and we evaluated all of those. The "off the shelf" ones weren't ideal because they were general and they weren't tailored to BreathCo needs" (Interview for the Quality Manager, December 2004) |
| | "Home working is going to become more of a norm rather than an exception. So if you have those, those concepts in mind then you have to deal with it" (Interview for the EDP Manager, December 2004) |
| Selection | "So that and the addition added to the cost. So we said what else can we do? And we discovered that there was an organisation dealing with *** [another part of BreathCo] who use Lotus Notes System, that develop Lotus Notes systems. So we asked, we got them involved" (Interview for the Quality Manager, December 2004) |
| | "I think the fact that we followed a reasonably established set process in that we were using a well known vendor was the best way to go" (Interview for the Product Performance Manager, January 2005) |
| | "They also demonstrated that, that their prices were very reasonable, for the quality of their goods, they're very flexible, i.e. you could ring them up anytime and they would answer questions. So we judged the supplier based on the work they'd done for us in the past" (Interview for the EDP Manager, December 2004) |
| Acquisition | "We had the flow, we had everything flow charted and we had several, several continuous development meetings with *** [the developer] and Info-Tec. So different development levels we would try out" (Interview for the Quality Manager, December 2004) |
| | "[Researcher] do you know how many revisions did the technology go through before a satisfactory system was developed? |
| | [Product performance manager] not of the top of my head Adrian, but there was a few, I mean if you had to say stick a number on it I would say between six or eight" (Interview for the Product Performance Manager, January 2005) |
| | "...I missed out or a couple of meetings but I got involved in the latter stage where I said what about this, what about that, what about the other so there was a few things missed out. I would imagine that it would be just sitting down going through these hard documents with him [the developer]" (Interview for the Customer Services Manager, January 2005) |

**Table III.**
Evidence of identification, selection, acquisition, exploitation, and protection issues

(*continued*)

| Process | Support |
|---|---|
| Exploitation | "[Lady trainee 3] where's all this go at the end of the day like? Where's all the information go at the end of the day?<br><br>[Trainer 2] quality department are the process owners *** [trainees name], so we will have overall control of it, but any, anybody really can run reports off, there are management functions and admin functions within it that people are not allowed to go into. But say, I mean, we use them, often enough in this process but say *** [shipping manager] at the end of the month knows he's got a problem, he can run a report off and analyse where his problems lie. Hopefully he's got to do that and address the problems, *** [engineering manger] for engineering problems, *** [sales and marketing manager] might, the customer services manager might if there's problems related to them" (Tuesday PM Training Session, July 2004)<br><br>"I do in the view of the fact that once we've got the information, once we do the analysis, the point should be that we analyse what are our major concerns statistically and we address them through PSP each one, or not each one, but if we use the 80/20 rule, which is part of the PSP process in GREAT you should be able to identify the top three, four, five concerns we have in volume and using PSP we should be able to analyse the problem and close the gap which is the ultimate aim under GREAT/PSP" (Interview for the Product Performance Manager, October 2004)<br><br>"Well what we're going to be doing is, when we're running reports from the concern basis, we've looking and highlighting the one that's causing the biggest concern, and we'll raise a PSP the problem solving process team, to identify what our problems are with that and see if we can get to the root cause and try and put in a corrective action, which we have started" (Interview for the 2nd Customer Services Team Leader, October 2004)<br><br>"Why? Because it's a good system and also dealing with concerns. At least any concern that comes into the company is logged now, where as previously somebody could have spoken to a representative and not taken their name and the concern could get lost and would have to be raised again by a customer. So this way it's logged down at least you've got names, and customers could, because even if they didn't get their name they could still trace it" (Interview for the Quality Mangers PA, December 2004) |
| Protection | "The best points for me was giving me a tool to use when I had queries to be able them to be dealt with and recorded and monitored" (Interview for the Accountant, December 2004)<br>"[Male trainee 4] what about any sensitive information that's put in there? Who will see it? Who will access it? If a reps in his car and he shows a competitor all this weeks hassle we're having with *** [gives an example of a product] and all that kind of stuff?<br><br>[Male trainee 2] does everybody have access to all the reports?<br><br>[Trainer 3] will the quality department are going to be the owners of the whole thing<br><br>[Trainer 4] well everyone's got a view of all the concerns, reports<br><br>[Trainer 3] maybe we should have limited view for some people" (Wednesday Training Session, July 2004)<br><br>"That's because of the lack of whatever, to push the system out on to off site users having access to the data and causing the company problems" (Interview for the Quality Manager, December 2004).<br><br>"Yea, I mean there has been a couple of little tweaks made to the actual, the database itself the fact that like putting the account number in, and the order numbers come up in one way. It would be better for them to come up in another way. So there has been a couple of minor modifications done on that" (Interview for the Customer Services Manager, January 2005) |

(*continued*)

**Table III.**

| Process | Support |
|---|---|
| | "They [EDP department] update information, I would imagine on a weekly basis with the, the input of customer accounts and any revised accounts that need to be sorted" (Interview for the 2nd Customer Services Team Leader, January 2005). |
| | "There are, every night we run a back up so, the data's backed up every night and we can go back two weeks from the devices we have here. The back up tapes are located in a fire proof safe over the road there, so it's in a safe environment" (Interview for the EDP Manager, December 2004) |
| | "Well I took out a support contract with them [Info-Tec] just in the early part of the, of the development, post go live. I think its always wise to have a contract in place in case some nasties come out of the wood work, which you hadn't anticipated" (Interview for the EDP Manager, December 2004) |

**Table III.**

- *Acquisition:* On selecting the most suitable IS the technology has to be brought into the organisation and undertake the activities it was identified and selected to undertake. This acquisition could take many forms including prototyping or incrementally replacing older technologies with the newer selected one. For example:

  > [Researcher] do you know how many revisions did the technology go through before a satisfactory system was developed? [Product performance manager] not of the top of my head Adrian, but there was a few, I mean if you had to say stick a number on it I would say between six or eight (Interview for the Product Performance Manager, January 2005).

- *Exploitation:* Once the IS has been acquired and configured correctly within the organisation, the technology needs to start being exploited to gain the advantages that the IS was identified as solving the problem situation. Therefore, exploitation can be undertaken in many forms and also includes issues such as user training, but usually relates to the purpose a project was initiated for (e.g. identify problems sooner, save time on certain processes). For example:

  > Well what we're going to be doing is, when we're running reports from the concern basis, we've looking and highlighting the one that's causing the biggest concern, and we'll raise a PSP the problem solving process team, to identify what our problems are with that and see if we can get to the root cause and try and put in a corrective action, which we have started (Interview for the 2nd Customer Services Team Leader, October 2004).

- *Protection:* The final process relates to protecting the IS. Protection can also be identified through many forms from physically protecting the IS from deterioration over the technologies life cycle, to protecting the data the technology may contain. Other protection issues may relate to keeping up to date with any training users require. If the IS cannot be protected it may lose value quicker than first anticipated and a project team could be undertaking all these processes a lot sooner than expected, therefore, many issues may need to be addressed when investigating how to protect the technology. For example:

  > [...] there are, every night we run a back up so, the data's backed up every night and we can go back two weeks from the devices we have here. The back up tapes are located in a fire proof safe over the road there, so it's in a safe environment (Interview for the EDP Manager, December 2004).

The points highlighted have been used to support the argument for the requirements of IS projects to undertake ISAEP processes. The next section discusses how to incorporate the technology management process framework with the softer issues that this work has argued for.

## Incorporating the technology management process framework

The original technology management process framework contains different formats of "maps" to undertake each stage (Phaal *et al.*, 2004a). There are no clear rules as to what maps to use and how the particular maps could be used. Therefore, a team could select the ones they see most value in. Whether maps or other tools are used relates to the team, group, or organisational processes required. Therefore, like the modelling that took place within the expanded SSM framework, these may relate to flow charts and rich pictures for example, as long as what is used can be communicated effectively to other individuals. This communication is undertaken through continuing to develop the dialogue and shared language. This is similar to the processes involved in the expanded SSM framework which was argued to help foster the issues of "the learning organisation". Having to undertake the ISAEP processes requires action to be taken. By incorporating this other thinking allows the more softer tacit issues to still be a focus of the work, which may not be considered under traditional ISAEP and formal technology roadmapping. Therefore, from the findings of the BreathCo case an overall model is proposed.

## Application of findings in the development of the overall practical model

From the findings of the BreathCo case it is argued that a complete framework that utilises both frameworks, with an overall emphasis on the softer tacit issues is important. This thinking comes from the generation of learning activities through conditions the framework creates. This framework also is hoped to carry on the learning processes through implementing an ICT, as the technology was designed to help individuals of the organisation with a problem which is why it was created. The complete framework espoused can be seen in Figure 5.

Figure 5 demonstrates the joining of the expanded SSM framework with the ISAEP processes to create the proposed learning framework. The joining of the two approaches takes the work undertaken between stages 1-7 as a filter to allow appropriate IS to be identified (see Phaal *et al.*, 2004a). From this filtration approach, the first part of the learning framework (the expanded SSM framework) has allowed a problem situation that was unstructured to be more formally structured while not viewing issues specifically related to IS. With this more emphasis can be placed on models that will allow purposeful action to be taken and not on IS. Starting the framework from stage 8 suggests that IS can easily be identified. Therefore, it is argued that the first part of the complete framework (stages 1-7) achieves the benefits that SSM espouses with the second framework to help undertake action. As has been highlighted earlier, moving from stage 7 to stage 8 may require a change of philosophy which may be a disadvantage to the overall approach. A boat has been placed between stages 7 and 8 to try and emphasise that while there are no set processes that can philosophically make this change more effective, a team has to navigate this divide as best they can to start identifying an appropriate IS. Therefore, once a project team plans to take action to improve the problem situation (the soft issues) to identifying a

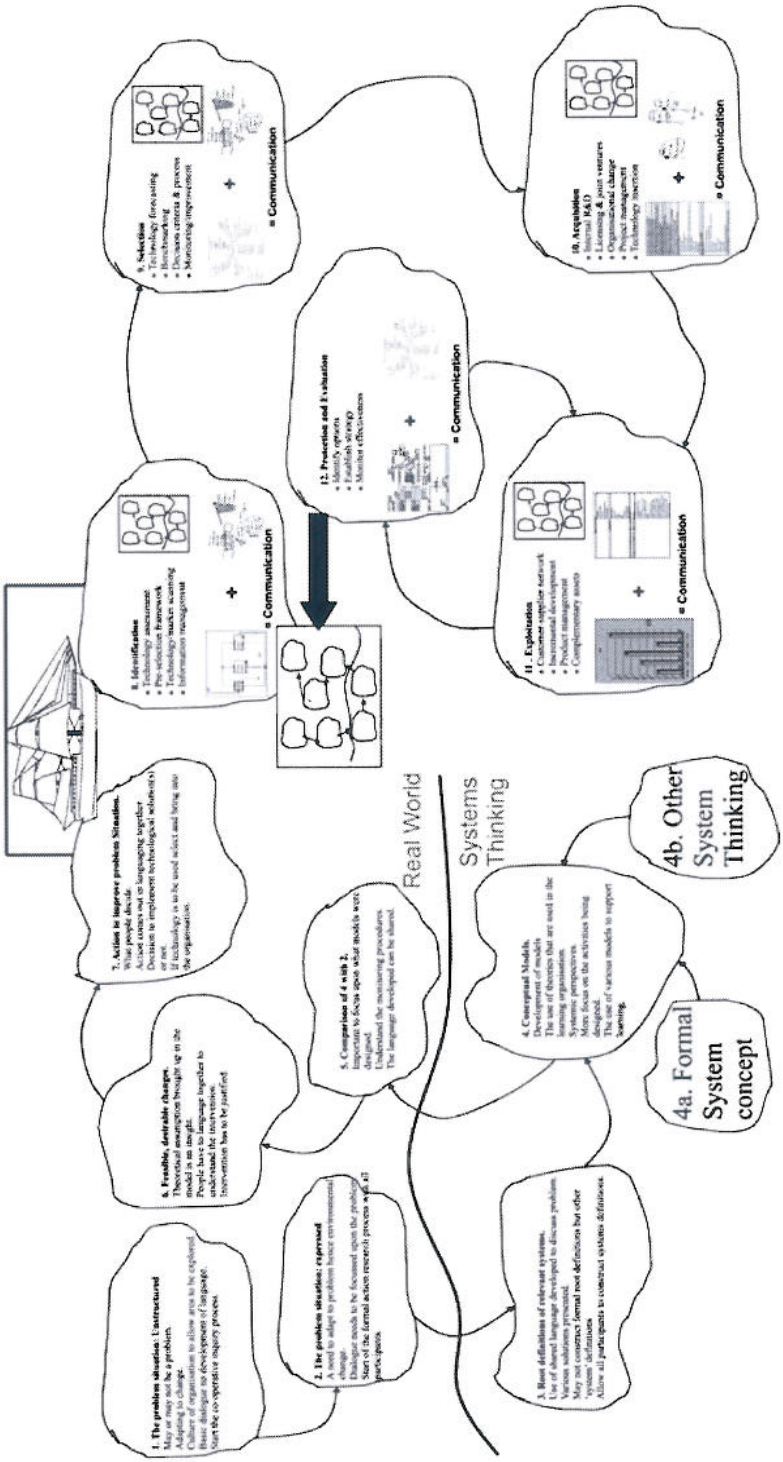



**Figure 5.**
A learning framework to support the learning activities for designing, implementing, and managing information systems

suitable technology (the more structured issues) may provide a weakness in the approach.

Upon entering the second part of the learning framework (stages 8-12) (the ISAEP processes) may still present problems. It is argued that the first framework can be used to help undertake these issues. This is why the symbol appears in each corner of the process to show the recursiveness of the learning framework. By undertaking the processes in this light allows the philosophy of the learning framework to focus on the softer issues as well as take action that each stage requires. In entering stage 8 a logical order is presented from identification through to protection and evaluation. Even though these processes are shown to move from one to the other a team could start at any stage and move backwards and forwards with stages being re-visited if required. This is the theme for the complete learning framework. For example, if a team is working on acquiring an IS but finding the process complex or difficult a move backwards may be taken. This would allow a perspective of why the IS was selected and may re-open a debate that can help clarify the selection issues and how strategies to acquire the IS more effectively, e.g. prototyping, or identity an IS that is easier to acquire but would still meet the requirements that would improve the problem situation. The aim of each stage is communicating key issues. Therefore, techniques a team find useful (e.g. brainstorming, rich pictures, conceptual models, flow charts) can be used to further develop the language of the community. Along with the team other individuals, such as developers or other IT specialists, that may only get involved in such a project at these stages will also require to be brought into such a community. The models developed will also help to communicate with these individuals. On leaving this stage the IS should be implemented within the organisation and being used.

The exploitation aspect of the learning framework (stage 11) is where the technology is being used and achieving the advantages, benefits, and issues relating to action for improving the problem envisioned at stage 1. This stage is linked to the final stage, stage 12. The final stage (stage 12) is where the implemented IS is protected. However, it is also considered that an evaluation process should also be included to check that the technology is being exploited to its full potential. For example, after a period time the technology implemented may not be able to be exploited any further. An unstructured problem therefore could be identified to have occurred. The difficulty is that these issues are tacit and ambiguous. If this situation is presented the complete learning framework may be worked through again to see if action can be taken to improve the problem situation. This is the link back to the first part of the learning framework shown next to stage 12. The entire framework therefore is argued as recursive. It is the advantages and the development of a complete learning framework that we argue is of value to organisations and should be further tested.

## Discussion and conclusions

This paper has set out to create an overall practical framework that can be used by a team to design, implement, and manage an IS on behalf of an organisation. The emphasis is on leveraging learning activities through undertaking the approach. The first part of the learning framework (stages 1-7) has firstly, taken Checkland (1993) and Checkland and Scholes' (1990) soft systems methodology (SSM) and expanded it to take into account learning organisation thinking as well as emphasise the approach as

more participative. Second, this has been attempted by trying to make double-loop learning and the five disciplines operational that Argyris and Schön (1978) and Senge (1990) argue create organisational learning and the learning organisation. These theories have been built into the stages of SSM. The work undertaken within this part helps design and discuss what the problem is that may require the use of an IS while the latter stages (5, 6 and 7) check what has been modelled, discussed and proposed will be both desirable and feasible for all individuals of an organisation. This part of the learning framework can be seen as a filter in which an appropriate IS will be identified and selected when moving into the management of technology section. The purpose of joining the two areas relates first, to the technology management process framework taking the identification of a technology as a simple process that can easily be undertaken through the numerous technologies available. Second, the expanded SSM framework can help structure the softer more tacit issues and help discuss and bring about action to improve them but how this improvement should be undertaken when a technology is envisioned is not stated.

While the overall approach has been designed to improve the limitations of current IS design, implementation, and management, problems are still evident. Problems relate to moving from these soft, tacit issues into the harder approaches of formal technology management. A change in philosophy may restrict other issues that are still applicable to be explored. In order to navigate from the expanded soft systems framework, the technology management process model has been expanded to take into account softer issues in undertaking ISAEP issues. These issues have been argued as requiring attention from the work of Phaal *et al.* (2004a, b, c) and the primary research conducted for this project. However, different individuals may have different ideas for undertaking these processes. Therefore, using the tools and thinking from the learning organisation may allow the many issues to be discussed through a dialogue, which in turn will create a shared language that is built on throughout the complete learning framework.

On reaching the final stages, undertaking a check or evaluation is argued for. This check is carried out to ensure that that the IS is meeting the benefits envisioned and the reason the project was initiated in the first place. Upon undertaking an evaluation and a consideration that the IS is not being exploited fully could be argued as a problem. However, the problem may be considered as tacit and unstructured so the complete learning framework can be undertaken again. It is this thinking that is the advantage to such an approach. A project team could start at any point while the outcome may not be an information systems development (ISD) project. This will depend on what is identified during the early stages. Therefore, the learning framework is recursive and is designed to help take purposeful action whether it is through the implementation of an IS or not. As this complete learning framework has been developed through practice, the framework needs to be re-tested within other organisations, problem situations, and settings.

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