The Co-evolution of Business/Information Systems
Strategic Alignment: An Exploratory Study

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Abstract
Achieving alignment between corporate business strategy and information systems (IS) investments remains one of the more enduring challenges for organisations. However, most research into alignment has attempted to reduce its inherent complexity to allow investigation of direct causal relationships. This tradition has had little impact on improving our understanding of the alignment process. Co-evolutionary theory provides a promising alternative, embracing complexity, and capturing the messy nature of alignment in practice. In particular, the feedback loops that are inherent with this perspective can promote either an improvement in alignment or further entrench an isolationist situation. This is rarely mentioned in the literature and is primarily due to the history of relationships between business and IS within the firm which impacts attitudes, knowledge and cognitive engagement. These then bound the choices available for future decisions and actions; that is, future actions are dependent on past actions. Adopting a co-evolutionary perspective, and using a grounded theory approach, a causal-loop model of the process of strategic alignment is constructed from empirical data. This model highlights the complex challenge of alignment faced in practice, in particular achieving a congruence of shared understanding, mutual trust, the desire to communicate and collaborate.

Keywords: Strategic Alignment, Co-evolution, IS Strategy, Business Strategy, Feedback Loops, Grounded Theory

Introduction

Achieving alignment between business and information systems (IS), hereafter referred to as alignment, has been a major concern of chief information officers (CIOs) for many years (Chan, 2002; Luftman & McLean 2004). It is widely established that there are a number of aspects, or dimensions, to alignment (Henderson & Venkatraman 1993) with strategic alignment receiving the most attention from researchers (see, for example, Chan & Reich 2007). Strategic alignment refers to the congruence between an organisation’s business and IS strategies (Preston & Karahanna 2009).

A feature of most research into alignment is that it attempts to reduce complexity to enable investigation of simple cause and effect relationships. This can create anomalies between studies (Campbell, Kay & Avison 2005). Consequently, we do not have any near complete models of alignment – just partial models of small aspects of alignment. More recent research that attempts to explicate the complexity of alignment would indicate that this situation is unlikely to improve in the near future (Benbya & McKelvey 2006a). However, this paper will argue, in part, that any move towards embracing complexity rather than attempting to reduce it, is likely to deepen our understanding of alignment.

Concentrating on one aspect of alignment at the expense of the other dimensions, is one example of reducing complexity in alignment research. Complexity is further reduced by adopting the assumption that strategies that are developed in a formal planning process will be implemented as intended. Achieving alignment then becomes simply a matter of improving IS planning methodologies (King 1988; Lederer & Sethi 1988) and ensuring that business and IS plans are formally integrated (Teo & King 1997). However, plans and strategies are rarely implemented as intended (Lewin & Volberda 1999; Mintzberg 1994). This is for many reasons – changes in the environment and, in particular, how lower level managers and personnel are motivated and measured (Castellano, Young & Harper 2004; Kerr 1995, 2003). Given a dynamic environment, insisting that IS plans are based on business plans, and then expecting them to be implemented explicitly, is more likely to result in mis-alignment rather than achieving the desired result. It would
appear that an approach that encourages the co-evolution and full integration of business and IS plans is more likely to be effective although achieving this has been problematic for many organisations (Earl 1993; King & Teo 2000; Preston & Karahanna 2009; Teo & King 1996).

A further example of this dominant perspective are definitions of alignment which often refer to the shared visions, goals and plans of business and IS executive managers (see, for example, Reich & Benbasat 2000). We believe that these raise at least two major issues. Firstly, they refer to plans, not strategies, and as noted earlier, the latter continuously change. Therefore definitions of alignment are concerned with an idealised future that cannot accommodate any deviation. Secondly, they are only concerned with what happens at an executive level and totally ignore events at an operational level. It is often events at this level that create the deviations in implemented strategies and while many authors have warned against this practice (Chan & Huff 1992; Ciborra 1997) it is still regularly ignored.

Benbya and McKelvey (2006) provide an encompassing definition for alignment being: “... a continuous co-evolutionary process that reconciles top-down 'rational designs' and bottom-up 'emergent processes' of consciously and coherently interrelating all components of the Business/IS relationship at three levels of analysis (strategic, operational and individual) in order to contribute to an organization's performance over time” (p. 287). They maintain that alignment occurs as business and IS groups co-evolve. Simply, any actions by the business will have an impact on IS and vice-versa. Each will evolve partly as a result of the actions of the other. This happens at all levels of an organisation and implies that alignment is affected by history, at multiple levels of an organisation and that causalities are both multi-directional and non-linear, forming feedback loops (Benbya & McKelvey 2006a).

This perspective is reflected in the work of Chan (2002) who investigated six business units that reportedly had achieved a high degree of alignment. In most instances she found that the informal relationships that had developed between the CEOs and CIOs (Chan only investigated alignment at the executive level) increased shared domain knowledge as they learned from each other. These
managers also respected and trusted each other whilst working closely together. They understood each others domain and could contribute to joint problem solving. The trust literature indicates that this type of situation then encourages the development of a stronger relationship, further collaboration and, consequently, increases shared domain knowledge (Lewicki & Bunker 1996; Nahapiet & Ghoshal 1998). Both managerial groups co-evolve and alignment is a natural result of that evolution. Chan (2002) reported that the relationship developed between the CEO and CIO then allowed these organisations to make use of the IT resource they had available. It could also be argued that the relationship itself is a form of resource as it enhances management capability. To be effective an organisation must make use of the resources it has available (Barney 1991; Eisenhardt & Martin 2000; Grant 1996). Similarly, the recent work in IS governance emphasizes the mechanisms of alignment, focusing on bringing business and IS staff together in a variety of forums outside of the formal organisational structure to make decisions concerning IS (Weill and Ross, 2004).

In this paper we use co-evolutionary theory as a lens to explore empirically alignment between business and IS strategies. Following a grounded theory method data was collected and a model of causal feedback loops developed. From this data, it is demonstrated that although positive feedback loops are an essential ingredient of co-evolution and alignment, their action can also prevent the development of relationships, shared domain knowledge and collaboration between business and IS managers and therefore alignment. Whether a virtuous or vicious cycle is in operation is often dependent on history. An instigating event can often tip the system from either a vicious or virtuous cycle to the other. We provide examples of some instigating events, some insignificant at the time, others dramatic.

**Co-evolutionary theory**

According to Teece, Pisano and Shuen (1997, p. 515) “[w]inners in the global marketplace have been firms that can demonstrate timely responsiveness and rapid and flexible product innovation,
coupled with the management capability to effectively coordinate and redeploy internal and external competences. …companies can accumulate a large stock of valuable technology assets and still not have many useful capabilities.” When applied to IS in organisations, this statement infers a number of resources and capabilities: the IT resource itself; relationships; the capability of IS staff; the capability of the CIO to manage both the IT resource and IS staff; and, most importantly, the capability of senior management (both IS and business) to manage the entire IS resource to derive competitive advantage through innovation. Each of these then becomes a resource available to the organisation. The development of these resources, or capabilities, in a highly dynamic environment is vital. According to Eisenhardt and Martin (2000, p. 1113): “[i]n high-velocity markets, the threat to competitive advantage comes not only from outside the firm, but also more insidiously from inside the firm through the potential collapse of dynamic capabilities.” This is reflected by research within the system dynamics field that has found that the performance of most systems is due to the interaction of endogenous, not exogenous, variables (Sterman 2000). As the environment changes so new capabilities must evolve on a continuous and ongoing basis. Co-evolutionary theory can advance our understanding of this process.

The term ‘co-evolution’ was coined in the 1960s by the American population biologist Paul Ralph Ehrlich and the botanist Peter Hamilton Raven to refer to evolutionary changes that occur in genetically unrelated species as they interact with each other in their environment (Futuyma & Slatkin 1983). The notion of the simultaneous or co-evolution of organisms and their environment has been applied to reason about the organisation-environment relationship with the aim of understanding organisational adaptation, recognising that the evolution of organisations cannot be understood independently from the simultaneous evolution of their environment (McKelvey 1997). Seminal work includes the application of co-evolutionary theory to the analysis of the competitive advantage of nations (Porter 1990), strategic management (Barnett & Hansen 1996), strategic alliances (Koza & Lewin 1998), and new organisational forms (Lewin & Volberda 1999). Although co-evolutionary theory receives increasing attention in the social sciences and organisation theory, it
has seen limited application to the study of IS.

In contrast to evolutionary theories, which view organisations, populations or other entities in isolation, the emerging co-evolutionary perspective emphasises the coupled evolution of multiple populations or forms (Amburgey & Singh 2002). Co-evolutionary thinking appreciates the embeddedness of organisations in a complex socio-cultural and historical context, where forces of change and interactions conflux and reverberate. It also allows a dynamic view of the processes and forces acting upon the organisation and its environment. In this paper, co-evolution is defined as “the joint outcome of managerial intentionality, environment, and institutional effects” (Lewin & Volberda 1999, p. 526).

Co-evolutionary theory argues that firms are complex systems (Kim & Kaplan 2006) that exhibit a number of characteristics:

*dynamic* – they change over time with various sections changing at different rates.

tightly coupled – actors interact with each other and with the environment; everything is connected.

governed by feedback – because of tight coupling, actions feed back on themselves. Each decision has an impact affecting future decisions.

*nonlinear* – effect is rarely proportional to cause. A small change in one location can cause a disproportionate change in another location.

*history-dependent* – history exerts a strong influence on future trajectories i.e., path dependencies.

*self-organising* – internal structure often dictates the performance of the system. This could be either to nullify an action, or amplify the effect over time.

*adaptive* – decision rules and actions of actors change over time often as result of experiential learning. However, due to complex nature of the system the learning may not be beneficial to overall system performance, enhancing one small section to the cost of other sections and overall performance.

*counterintuitive* – cause and effect are often separated by time and space. They are difficult to correlate. In many instances decisions are made to act on symptoms, not causes. is the consequence can be that actors just push harder and achieve nothing except expenditure of time, effort and resources.

*policy resistant* – in many situations “obvious” solutions, aimed at symptoms, often make the situation worse.

*trade-offs* – time delays between cause and effect mean that there is often short term, then long term, results. Often solutions, aimed at symptoms rather than hard to identify causes, cause an initial improvement followed by a long term deterioration in performance (Sterman 2000, p. 22).
Co-evolutionary theory emphasises the coupled evolution of multiple populations or forms whilst conforming to the characteristics of complex systems. When applied to organisational studies it postulates that actors, individual people or groups of people, interrelate with each other and their surroundings. These actors have an unlimited capability to adapt their behaviour, subject to prior experience. However the behaviour of actors is influenced by the actions of other actors and the system itself. As actors are also capable of anticipating the results of their actions they are capable of changing their actions thus evolving and learning. The resulting “system” is self-organising as new patterns become the result of interactions between actors (Benbya & McKelvey 2006b).

Fundamentally, the environment in which actors operate is a result of their prior actions. These prior actions can often constrain future actions as they become (informal) rules or routines to be followed. If actor A anticipates the results of his or her actions then makes a different decision, actor A is effectively ‘breaking the rules’. It is at this point that evolution occurs. The new action will then force other actors to re-evaluate their future actions. In response actor B may also choose to make a different decision based on the action of actor A. It is at this point that co-evolution occurs. If enough actors within the system elect to change their actions in response to others actions the result can be the development of new knowledge, capabilities and innovation.

However, there is no guarantee that co-evolution will occur. Rather than changing his, or her, own response to the action of actor A, actor B may take action that encourages actor A to, in future, conform to the informal rules already in existence. This is the normal situation in most organizations as it encourages inertia. It is “the way we do things 'round here” and cannot be underestimated. Actor A could represent a business manager or unit, and actor B an IS manager or unit (or vice versa – it makes no difference) suggesting why many organisations are unable to improve either their alignment or innovative use of IT.

Under a co-evolutionary view, the fundamental characteristics of environments are uncertainty, complexity, munificence, graininess, fitness and niches (McKelvey 1997), which shape a particular view of the relationship between an organisation and its environment. Key characteristics of this
relationship are summarised in Table 1.

Organisations, or business units, do not lead isolated lives but instead are linked inextricably with others. The success of one organisation may therefore be as much a function of what other organisations do as what the organisation itself does. Moreover, a cluster of organisations inhabits a landscape (just as a species does) and landscapes are coupled with other landscapes. The actions of a firm therefore not only impinge on its own landscape but on other landscapes too (Kauffman 1995).

An organisation’s prospect to co-evolve successfully with its environment depends on a large number of factors, key among those are: its fitness function, absorptive capacity, and value creation mode. The notion of the fitness function seeks to capture the idea of how well the organisation fits the landscape, in terms of its capability for coping with disorder and uncertainty (Fombrun 1988). Absorptive capacity, which concerns a firm’s ability to assimilate new knowledge, including the speed at which it can learn, has a mediating effect on the organisation’s adaptability (Cohen & Levinthal 1990). Value creation can be pursued through strategies of exploration and exploitation, an idea originally proposed by March’s (1991) organisational learning model that links firm adaptation to changes in its population. Exploration concerns the strategy of prospecting for new landscapes to discover new opportunities for value creation. This involves innovation, R&D, venturing, risk-taking, developing new capabilities and investing in the firm’s absorptive capacity (Koza & Lewin 1998). Exploitation aims at increasing the productivity of existing capabilities and employed capital and assets. Environmental discontinuities such as new entrants or disruptive technology can promote new conditions for competition and destroy existing competencies (Tushman & Anderson 1986).

Co-evolutionary theory approaches its subject of study by identifying its 1) antecedent conditions; 2) co-evolving activities, actions and processes; and 3) their outcome (Koza & Lewin 1998). For instance, research using co-evolutionary theory has explained the emergence of new organisation forms as an outcome of the co-evolution of the competitive environment, firm intentionality, and the
institutional environment of the firm (Lewin & Volberda 1999). For example, Kieser (1989) shows how medieval guilds were replaced by mercantilist factories as markets and institutions co-evolved.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
<th>Example of Application</th>
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<tr>
<td>Multi-level effects</td>
<td>Co-evolutionary effects take place at multiple levels within firms (micro-co-evolution) and between firms and their niche (macro-co-evolution).</td>
<td>Organisational novelty (Crowston, 1996); Networks (Ruef, 1996); Organization design (Bruderer and Singh, 1996)</td>
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<td>Multi-directional causalities</td>
<td>Co-evolutionary effects result from multi-directional causalities within a complex system of relationships where changes in variables are caused by changes in others.</td>
<td>Competition (Baum, 1999); Micro-and macro-co-evolution interdependencies (McKelvey, 1997)</td>
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<tr>
<td>Non-linearity</td>
<td>Co-evolutionary effects are not tractable through a simple cause-effect logic of linear relations between independent and dependent variables.</td>
<td>Casti, 1994</td>
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<tr>
<td>Positive feedback</td>
<td>Actions and interactions between firms and their environments are recursive and result in interdependencies and circular causality.</td>
<td>New organisational forms (Lewin and Volberda, 1999)</td>
</tr>
<tr>
<td>Path and history dependencies</td>
<td>Adaptation is path- and history-dependent. Restricting and enabling constraints of organisation path dependence.</td>
<td>Social structure (Stinchcombe, 1965); Markets and institutions (Kieser, 1989); Institutional models (Calori et al., 1997)</td>
</tr>
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<td>Smooth versus rugged fitness landscapes</td>
<td>Every time an organisation’s fitness changes, the fitness of its landscape changes. An increase in one firm’s fitness results in a decrease of rival firms’ fitness.</td>
<td>Levinthal (1997)</td>
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**Table 1** Properties of co-evolutionary organisation-environment relationships (source: Peppard & Breu 2003).

Benbya and McKelvey (2006a) used the first four characteristics of co-evolution in Table 1 to describe the co-evolution of strategic alignment from a theoretical perspective. Inexplicably these authors chose not to include the fifth property, path and history dependence, even though there is evidence to support its importance in alignment (Hirschheim & Sabherwal 2001; Peppard 2007). Additionally McKelvey, one of the most influential advocates of co-evolutionary theory in organisation studies, has written of its general importance.

Alignment can co-evolve at three levels: strategic, operational and individual (Benbya & McKelvey 2006a). Business strategies change (Lewin & Volberda 1999; Mintzberg 1994) and so IS strategies must also change to reflect bottom-up emergent strategies that can occur. This requires bottom-up approaches to strategy alignment that rely on collaboration and broad participation from many
actors.

It has also been observed that business and IS managers are often unable to express themselves in a common language (Bassellier & Benbasat 2004; Preston & Karahanna 2009). As a consequence, they may be unable to understand each others complexities and the result can be a mismatch between business and IS strategies and architectures (Benbya & McKelvey 2006a). To overcome these possible outcomes, (Benbya & McKelvey 2006a)argue that collaborative partnerships must be built between business and IS managers at all levels to develop shared domain knowledge and an ability to coordinate actions relating to alignment. However, as will be demonstrated later in the paper, the feedback loops in operation in many organisations together with path dependency and history often make this extremely difficult to achieve.

All of the above is based on the premise that business and IS managers can communicate with each other and collaborate. In many instances this is not the case (Bashein & Markus 1997; Feeny, Edwards & Simpson 1992; Ward & Peppard 1996). Accordingly, there have been numerous calls in the alignment literature to improve communication between senior business and IS managers (Luftman & Kempaiah 2007). However if a co-evolutionary view is adopted then any attempt to initiate communication is just one variable within what can be a complex feedback loop. Feedback within the loop may mean that an attempt to initiate communication by a manager may be either rejected or accepted by the other but, in the latter case, with a high degree of caution. This factor is almost totally ignored in the literature which assumes that any approach by a manager to initiate communication or collaboration will be reciprocated by the other.

Alignment is a complex system. Any complex system consists of combinations of positive and negative feedback loops. These are a series of cause and effect dyads that, when linked together, form loops with action eventually returning to the originating variable. A negative feedback loop is goal seeking. That is, any action taken by an actor will be nullified by the feedback throughout the loop. The performance of these loops cannot be changed in the long term. Performance tends to oscillate within a relatively narrow band as feedback passes around the loop (Morecroft 2007).
Positive feedback loops are ‘deviation amplifying’ (Benbya & McKelvey 2006a; Morecroft 2007; Sterman 2000). With these loops, an action taken by an actor will be amplified due to the feedback within the loop. A simple example is compound interest in a bank account. Interest is paid and adds to the principal. The next payment of interest will therefore be greater leading to an even greater increase in the principal. That is, growth within a positive feedback loop tends to be exponential. However, positive feedback loops can also promote decay depending on the direction of the original action. This creates the classic virtuous or vicious cycles so well known in the literature. We have observed that the proponents of co-evolution theory generally only consider virtuous cycles. The opposite possibility is generally ignored where, in our example and given the existence of a dominant positive feedback loop, the level of alignment could actually be getting worse over time. This deviation is amplified over time entrenching the division between business and IS. This situation is also a form of co-evolution. Both the business and IS groups have reacted to each other's actions to reach this position.

It is possible that a trigger could act on a vicious positive feedback loop transforming it to a virtuous feedback loop – or vice versa. Benbya & McKelvey (2006a) discuss the importance of triggers but only in the context of generating “good” co-evolution. They do not consider the possibility that a trigger could result in the destruction of a formerly high level of alignment. For example, research suggests that the CEOs or owners of small to medium enterprises (SME) select IT managers based on their technical ability, not on their ability to communicate, collaborate or provide strategic input to the business. A result of this is normally poor communication and collaboration between these managers (Gramignoli, Ravarini & Tagliavini 1999). This, then, provides an initial trigger that could act on a positive feedback loop cementing in place a division between business and IS. Due to the deviation amplification nature of positive feedback loops this situation is then most likely to persist as the organisation expands.
Methodology

This research used the Glaserian form of grounded theory development informed by an interpretive epistemology and constructionist ontology to investigate the process of business/IS alignment. The objective was to develop, rather than test, a theory that could explain practitioners’ reaction to what they considered their core problem of alignment. Data analysis identified this as the difference between espoused business strategies and the actions taken by business managers to achieve their goals.

Initial data collection was via three unstructured focus groups (Morgan 1998; Stewart & Shamdasani 1990). Two of the focus groups consisted of six senior IS managers each whilst the third focus group consisted of three senior business managers. The use of unstructured focus groups partly resolved the dilemma created by Glaser's recommendation that a literature review should not be conducted prior to data collection and analysis (Glaser 1992; Urquhart & Fernandez 2006). Their use transferred power from the facilitator to participants (Blackburn & Stokes 2000). Subjects were then able to discuss factors regarding alignment that were important to themselves rather than being directed to discuss factors identified by the researcher from the literature. The instrument for the subsequent individual semi-structured interviews was then developed from the analysis of these focus groups. This, then, reduced the impact of prior reading on data collection and analysis (Campbell 2009). Analysis of the focus group transcripts then informed a series of semi-structured individual interviews (Fontana & Frey 2000). Nine IS managers were individually interviewed. Two of these managers had been part of focus groups. One manager was interviewed twice.

Sampling of subjects for both the focus groups and individual interviews was purposive (Glaser 1998; Morgan 1997) with no attempt being made to ensure that the sample was representative. Subjects were recruited from a number of industries and organisations of various sizes from small to medium manufacturing firms, to very large Australian based financial institutions and fast moving goods manufacturers, to the Australian branches of large multi-national organisations. Participants were also selected to represent various levels of management, from a managing director...
Sampling continued until saturation occurred – when no new conceptualisations emerged from the interview data, no new properties of categories emerged and no new relationships between categories emerged (Dey 1999; Urquhart 2001).

All interviews were recorded, transcribed and then analysed from an interpretive perspective using the interactive coding family. The latter does not assume linear causality but rather “… mutual effects, reciprocity, mutual trajectory, mutual dependency, interdependence, interaction of effects, covariance. This code is an effort to capture the interacting pattern of two or more variables, when the analyst cannot say which comes first. Nor does it matter, probably” (Glaser, 1978, p. 76 ). Most interviews were analysed, with the aid of Nvivo, a computer aided qualitative data analysis software (Richards 1999), on three separate occasions and subjected to both open and axial coding (Strauss & Corbin 1990). Later interviews were less rigorously analysed, being mainly subjected to open and theoretical coding to fill in gaps in the emerging theory to ensure saturation (Glaser 1978).

It was noted at the time that the substantive theory that emerged from the data was, in fact, an example of the more general co-evolutionary theory. It is presented here as such.

A feature of many grounded theory reports is that, due to the restriction on a priori reading and the insistence on inductive theory development from primary data, the literature is often not introduced until the theory has been at least partially developed. It is then often introduced during the discussion where it is able to “include, transcend, synthesise and organise” the extant literature (Glaser 1996, p. xiv). This paper follows that tradition.

**A Co-evolutionary Model of Business/IS Strategic Alignment**
The core concern of the IS managers within this study was the difference between espoused business strategies and those they could see being implemented by their managerial peers in the business. This, of itself, probably explains the continued importance of strategic alignment to practitioners. Some of the managers in this study were able to resolve this situation by forming relationships with their business colleagues. Others were not. The discussion that follows shows
why some IS managers can form relationships while others struggle in this quest. The data suggests it rarely has anything to do with individual desires. From the diagram in Figure 1 we can demonstrate that feedback within various loops determines what is generally possible within a given organisation. Where operational level managers are able to form relationships they tend to support the actions of their business manager peers, not the strategies contained within plans. This has implications for alignment research and will be discussed later.

Participants indicated that collaboration between IS and business managers is an important aspect of alignment which they generally defined as business and IT personnel working together to achieve a common goal. This reflects the work of Chan who found that the informal structure and the relationship between CIO and CEO, is more important than previously thought in achieving alignment. Therefore the diagram presented in Figure 1 concentrates on collaboration rather than including a specific variable for alignment. The argument developed earlier is that collaboration is essential for alignment. Additionally, the model will be used to show why encouraging communication and collaboration between IS and business units is so problematic for many organisations. Examples of triggers that change this situation will be provided.

**Figure 1** A model of IS/Business Collaboration

Each variable represents a level – the item described by the variable name could be measured if needed. Each variable is connected to at least one other variable via an arrow. The direction of the
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arrow indicates the causal influence. Additionally, each arrow is accompanied by either a “+” or “-” at its head. A positive connection (+) indicates that any change in the causal variable will instigate a change in the same direction in the target variable beyond what it would otherwise have been (Sterman 2000). For example, reading from the right hand side of the diagram, any increase in IT Resources required will cause an increase in the IT Resources gap above what it would otherwise have been. The opposite also applies: any decrease in IT Resources required will lead to a decrease in the IT resources gap below what it would otherwise have been. A negative connection indicates that the reaction of the target variable is in the opposite direction to the movement in the causal variable. For example, an increase in Current IT resources will lead to a decrease in IT Resources gap below what it would otherwise have been.

In the model, IT Resources gap and Skills gap are included because they impact Ability to perform. If either the IT Resources gap or Skills gap increases then the Ability to perform will decrease below what it would have been. However, the participants also indicated that Appropriate performance metrics also impact Ability to perform. A number of managers suggested that the rhetoric within their organisations was that IS should seek opportunities for competitive advantage while the reality was that, in some organisations, IT was measured purely on its cost to the organisation. This is a classic case of rewarding for B while hoping for A (Kerr 1995). Individuals and groups will always perform to the measure being applied, not what management would like to achieve (Kerr 2003). The connection in Figure 1 illustrates that, providing Appropriate performance metrics are being applied then the Ability to perform will increase above what it would otherwise have been. Conversely if the performance metrics are inappropriate then the ability of the IT group to perform to the desired standard will decrease.

Tracing around this loop, if the Ability to perform increases it will contribute to Perceived IT success. However, the experience of most of the IS managers within the study then indicated that a result of an improvement in their success was that they then received Requests for additional projects, but without being provided additional resources. This then adversely impacted their Ability
to perform. This is a negative feedback loop. Thus an initial improvement in Ability to perform will eventually result in a reduced Ability to perform. Similarly, when considered only as a part of this loop, Perceived IT success will also tend to oscillate within a narrow band.

This construct was developed by the group of IS managers within the first focus group. Although recognising its over simplification they indicated that it captured their experience, that they were unable to sustain project performance improvement, and they did not elaborate further as it was outside the scope of the study. It is included in Figure 1 only because these IS managers believe that Perceived IT success eventually impacts their credibility, or Mutual trust, and consequently their ability to communicate and form relationships with business managers. This belief is consistent with earlier research (Bashein & Markus 1997). However, unlike the managers in the study of Bashien & Markus (1997) they understood that improving their technical abilities was not an effective method of improving Mutual trust as a precursor to instigating communication with business peers.

This negative feedback loop has been labelled “Never Get Ahead” in Figure 1 as it captures the essence of IT managers’ experience. A negative feedback loop can also be indicated with the use of a balance. This denotes that values of variables within the loop are balanced within a given range. There is unlikely to be any long term increase or decrease in these values.

Consider the loops “More of the Same” and “Learning (or not)” shown in Figure 1, both of which are positive feedback loops that exhibit deviance amplification (Lewin & Volberda 1999). This is indicated in the diagram by the use of an icon representing a snowball gathering momentum and size as it runs downhill.

If an increase in Perceived IT success is achieved then IT Status will also improve beyond what it would otherwise have been. The latter variable is at a high level of abstraction and includes such items as:

- The perceived IS role within the organisation, whether this is to provide competitive
advantage or a low cost reliable service. This role tends to affect the governance, authority and autonomy of the IS group. It also tends to affect organisation structure and the physical location of IS personnel – whether they are located away from, or with, the business unit(s) they support.

- The perception of IT, whether it is considered helpful or, as an extreme, dysfunctional. That is, IS status can also include the attitude of staff towards the IS group.

- The history of the relationship between the IS organisation and the business.

Some participants suggested the level of IS Status was partly due to the relative youth of the IS discipline and a corresponding lack of understanding by business managers. A CIO of a large fast moving consumer goods manufacturer noted:

... technology is still seen as being separate. It's still the mystical thing. It's still a little bit 'black boxy.' It's still 'that's the IT guys sitting over there, and we don't want to talk to them and they don't want to talk to us. And they're propeller heads and we don't understand what they do but, oh shit, we better humour them a bit.' There's a bit of that still, and it's not just about the strategy bit. It's about the whole engagement.

In this study IS Status was identified as the variable having the most effect on an IS manager's ability to make choices and take action. Within the first minute of the first focus group an IS manager remarked:

... things are already in place with history. Things that happen in the past and it takes a very professional view to get past mistakes and bad experiences and still work together in the future.

Where IS Status is low, the actions of IS managers is usually restricted to providing a low cost reliable IT infrastructure. The attitude of IS managers working in this environment is often one of “I do what I'm told.” Communication with business managers is not encouraged. IS projects are often
given to the IS group without prior discussion. The IS group tends to be physically isolated from the rest of the business which further impedes communication. This has a knock-on effect on the development of relationships and trust between IS and business managers and groups. The data suggested this aspect to be particularly important.

Where IS Status is high it is more likely that the perceived role of IS will be to support the achievement of strategy. Because of this, business managers are more inclined to commence communication with IS managers. The focus of an IS group in this environment is adding business value, whilst its attitude is “keep our customers happy.” IS managers in the study also indicated that where IS Status is high they tend to have more autonomy and authority. The CIO is also more likely to report to the CEO rather than another executive officer.

Analysing the interview transcripts suggests that as IS Status improves then both business and IS managers will have a greater Ability to communicate as well as a Desire to communicate as the environment in which they operate makes communication possible. The opposite also applies. Where IS Status is low managers have less ability and desire to communicate. Low IS Status, a poor history of IS project delivery, fractured relationships and a perception of IS being a cost centre can mean that there is little advantage to a business manager in interacting with an IS manager. Any approach by an IS manager to expand the scope of dialogue is likely to be rejected unless there is mutual benefit (Brown 1993). The IS literature contains many calls for CIOs to improve communication, but for many this may be difficult.

When discussing communication, many subjects of this study emphasised communication that was able to influence the decisions of others, not casual communication. Their concept of communication was therefore similar to the 'mutual influence' of Nelson & Cooprider (1996). Our managers universally believed that the development of communication, relationships and trust is essential in attaining alignment. An ex-CIO emphasised the role of trust and relationships:

*That's what the relationship is about. It's building trust to a point where when you hit a road block in the communication you’ve got something to come back from, to*
rebuild from. ...relationships kept the channel of communication open for when there was a problem. So it’s not that something goes down railroad tracks and never comes off the path, things always come off the path. It’s about how quickly and how accurately you get feedback...

He later made the comment that a strong trusting relationship can help repair a broken process but establishing a process, or governance mechanism, will never fix a broken relationship.

Our participants, and the literature, indicate that Communication is essential in the development of Relationships between people (Lewicki & Bunker 1996), in this instance business and IS managers. Both our participants and the literature indicate that there is a recursive relationship between these two variables. Communication is essential to commence a relationship, but as a relationship develops it encourages further communication (Lewicki & Bunker 1996). This is illustrated in the diagram. However, it has already been shown that in many organisations meaningful communication is next to impossible due to the influence of IS Status. This then means that for many organisations where IS status is low, it is unlikely that relationships and trust will develop between IS and business managers.

A confounding influence is that relationships and trust are most likely to develop between people who hold common attributes such as education, beliefs, dress codes etc. (Bashein & Markus 1997). This is often not the case when considering IS and business managers. One major area of difference can be their separate language and systems of meaning. A CIO elaborated:

"Maybe one of the issues is that people who are in those senior roles within a functional area are there, to a large extent, from their success in their functional area. And, for whatever reason, that sort of blindsides them from being able to take someone else’s perspective. So, an HR director might not be able to see why their input is crucially important to an information systems plan and vice versa."

This same CIO then gave an example. He was at one time the CIO of a publishing firm and was
attempting to work with book editors. In his role he described their work using the term “process” which he thought self-explanatory. However the editors related a process to manufacturing, not the work they were doing which they considered to be creative. They were fearful he was attempting to downgrade their role to that of a production line worker.

When asked, a senior IS manager nominated a shared system of meaning as the second most important enabler of alignment and saying:

*The ability of IT staff to understand business issues and communicate new things in the language of the business. So, not just talking in bits and bytes, but talking in terms of strategic direction and enabling that stuff to happen*

Analysing the data suggested that as *Desire* and *Ability to communicate*, *Relationships* and *Mutual trust* begin to improve so does a *Shared system of meaning*. Members of both the IS and business units begin to understand each others language and technical jargon so improving any future communication. This, then, reduces the perceived differences between the two groups, encouraging further communication.

The data indicates that improvements in a *Shared system of meaning* can also lead to increases in *Shared domain knowledge* which, according to earlier research, is the variable that has the most impact on performance (Nelson & Cooprider 1996) and alignment in the long term (Reich & Benbasat 2000; Preston and Karahanna, 2009). This can lead to improved collaboration between IS and business units.

The links between communication, trust, shared system of meaning, shared domain knowledge and then performance is well understood in the management literature (Nahapiet & Ghoshal 1998). This, then, creates a separate positive feedback loop, “Learning (or not)” shown in the diagram. An increase in meaningful communication fosters relationships and trust between IS and business managers. As this occurs they develop a shared system of meaning and shared domain knowledge. The understanding, knowledge and abilities of both groups co-evolve. This is understood in the IS
literature (Nelson & Cooprider 1996; Reich & Benbasat 2000). The data in this study indicates that as shared domain knowledge improves it encourages further communication creating a positive feedback loop. But, as with all positive feedback loops, the amplification can be negative. If IS Status discourages communication then the value of all the variables in this loop will also decay over time to a point where they approach a zero value.

*Shared domain knowledge* is also part of a larger feedback loop, “More of the same”, that includes all the variables so far discussed as well as *Collaboration* and *Perceived IT success*. With respect to alignment, the objective of the IS managers interviewed in developing relationships and shared domain knowledge was to understand the goals of their business peers as these were often different to the goals and strategies contained in formal plans. An IS manager in a multi-national consumer goods manufacturer commented:

> How do you know if what you're doing is in the right direction if you don't have these relationships? You develop the networks, you develop an understanding of what the business wants, or the strategy that is required. If you didn't have the relationship you couldn't be in alignment, because what would you be in alignment with? You wouldn't know anything.

The understanding of business managers' goals then allowed IS managers to collaborate with their business peers and assist them in achieving those goals. An observation during the study, although not formally investigated, was that where possible IS managers formed relationship with peer level managers, not with managers at a higher hierarchical level than themselves. Their primary concern was to support their peer's goals, not those of the organisation which are normally difficult to understand and implement at an operational level.

Many of the participants in this research indicated that it is the relationships and collaboration that provides alignment, not strategic plans. For example, one CIO noted:

> ... the work I did on the IT strategic plan a couple of years ago, it was more the
relationship building which aligned IT with business areas, and more the
communication than the plan itself. It was the act of working with the people which
aligned it. I mean the plan, it really was irrelevant what it said. If the fact it brought
us together and got us talking, and meaning that we made eye contact in the lift,
rather than looking at the numbers or whatever. That was what helped the most, I
think.

This same manager then indicated that the plan documents intent and still provides some overall
direction but is not regarded as providing alignment in itself. She provided a similar view regarding
the importance of relationships and collaboration at an executive level:

*I mean the main thing I think it comes down to is the legitimacy we have within the
organisation. And that's largely based on the personal relationships between the
executives and our management. So that when that breaks down, we've got real
problems. And it's broken down before a few years ago, but it's quite good at the
moment. And I see that as the main groundwork for aligning. If that's not there then
it's really difficult to build on anything.*

This quotation provides an indication of the connection between relationships, collaboration and IS
Status.

Where collaboration occurred the emphasis of IS managers was on providing business value whilst
their attitude was one of keeping their customer happy. These then tend to impact *Perceived IT
success*. Both IS and business units and managers were thus coevolving. Where a virtuous cycle is
evident managers learned about each others problems, constraints and also what they were
attempting to achieve. They learn together, encouraging *Collaboration* and improving *Perceived IS
success* and, eventually, *IS Status*. Given this situation it is more likely that the CIO will be invited
to strategic planning sessions. Likewise, it is more likely that senior business managers will be
involved in the development of IS strategic plans, leading to a higher level of alignment.
From the data, there appears to be a positive correlation between Collaboration and IS Status, particularly the attitude of business managers towards the role of IS within the firm and also in the governance, authority and autonomy of the IS function. We observed that where collaboration occurs between IS and business units and managers, the CIO is more likely to report to the CEO. We also noticed that it was often the case that in this situation the IS group had some discretionary funds available to conduct experiments or run pilots, improve services or meet other emerging needs.

In every instance where collaboration between IS and business units and managers was not evident, the CIO reported to either the CFO or another executive officer who then acted as a gate keeper to the CEO. In each of these organizations, IS was considered as a cost centre with an ongoing focus to reduce costs even further. CIOs in these organisations reacted to this, providing a reliable, low cost service but not making any suggestions of how IS could be used more effectively. Often, this was not necessarily because they didn't want to – in many instances it was because the environment meant they were unable to make suggestions. Any recommendations inevitably involved spending, which was not supported by the CFO to whom they reported. Although anecdotal, we detected a high degree of frustration in the IS managers and CIOs operating in these conditions.

We also observed a tendency in these organisations to outsource any business process improvement initiatives. An example is a large multi-national electronic consumer goods manufacturer. The rhetoric of senior management was that IS provided competitive advantage to the firm. The reality according to a senior business executive within the firm was that IS was measured as a cost centre. The IS group reported to the CFO; its primary function was to maintain the internal network at the lowest possible cost. When this organisation decided to implement an ERP system the internal IS group was not consulted, nor was it a part of the implementation. Business managers became the project leaders and consultants were used for implementation. However, the internal IS group was then expected to maintain the new hardware. This IS group had no influence, no authority and no autonomy.
Even simple recommendations became frustrating due to the lack of IS knowledge by other senior managers. The senior IS manager of a small manufacturer had made a recommendation some years previously to register a domain name for the internet. This was rejected due to a combination of cost and a lack of understanding of its future importance by the CFO who refused to forward the suggestion to other executive officers. At the time of interview the organisation was attempting to move into international markets and needed an internet presence. Another entity had registered the preferred domain name although it was unused. That entity was now offering the domain name to the manufacturer but at a highly inflated price.

We also noticed that where collaboration between business and IS groups was low the IS group had relatively few discretionary funds available in its budget. In most instances funds were tied to individual projects with IS managers resorting to creative accounting practices to make some of those funds available for other activities. Where collaboration did not exist, business and IS plans were created in isolation and did not refer to each other.

In either situation, high or low levels of collaboration, there was a connection to *Perceived IS success* and then to *IS Status*. This connection completes the loop. When considering the outside loop “More of the Same” it is clear that an improvement in any variable will cause improvements in all other variables beyond what they would otherwise have been. Similarly, any erosion of the value of any variable will lead to erosion in the value of all other variables. The deviance amplification nature of positive feedback loops means that a situation where collaboration is apparent or not will be strengthened over time. Changing the situation then becomes problematic. The senior business manager of the multi-national electronics consumer goods manufacturer gave an example.

The IS group within his organisation had very low status. It was measured on cost and reacted accordingly. The group was totally reactive as any proactive action would inevitably increase costs. One effect of considering an IS group as being a cost centre is that there is then little need to communicate and collaborate. A consequence is that the IS group is then labeled unhelpful and uncommunicative by the rest of the business. The CIO of this firm then launched an initiative to
change this situation by issuing monthly reports that he thought would be of value to business unit managers. It was a first attempt at communication. These reports were rejected on the basis of their being created by the IS department and therefore, by definition, unreliable and using suspect data. Our subject said that no attempt was made by business managers to verify the validity of the data and reports. By automatically rejecting the reports the business managers avoided questioning their own beliefs and attitudes while at the same time maintaining the status quo (Argyris 2003).

Communication, trust and collaboration between business and IS in this organisation remains virtually non-existent. From the interviews, it seems that it is always the IS group that is seen as uncommunicative even though business personnel are just as reluctant to commence communication.

The data demonstrated that the effect of positive feedback loops reinforce the presence or absence of collaboration between IS and business managers and groups within an organisation. However, it is possible than an instigating event, or trigger, can change the behaviour of a positive feedback loop (Benbya & McKelvey 2006a).

For example, in a medium sized law firm a new partner was employed. This partner had previous positive experiences with IS and approached the senior IS manager with a request. The IS manager, a subject in this research, responded positively. The small project was a success and further requests were made. In the words of the IS manager “communication happened.” This then spread to other partners and sections of the business resulting in a generally higher degree of collaboration between IS and the business. When related to the diagram in Figure 1, the partner wanted an improvement in overall performance leading to an increase in the Performance gap. The partner's Desire to communicate then increased as a first move to improve performance. The data indicates this is typical.

This suggests that where a vicious cycle is in evidence all managers must be aware of approaches by their peers. The danger is that most managers will react the way they always have and without thinking due to the influence of IS Status. Most people do this as it is efficient, reacting
automatically according to the unwritten rules of the environment, without questioning consequences or our underlying beliefs and assumptions (Argyris 2003; Senge 1990). This highlights path dependence (Lewin & Volberda 1999). Although Benbya & McKelvey (2006a) did not consider path dependence and history in their description of alignment as co-evolution, our data suggests that it is vital. Past actions bound future actions by constraining our cognitive ability. Every IS manager within this study who worked in a situation where IS Status, and as a result Ability to communicate, was low lamented that nearly all attempts to commence meaningful communication with business peers were rejected. However, other subjects gave examples of approaches by business managers being rejected by IS peers. Both parties are equally, and unknowingly, guilty.

Because of path dependence and history limiting future actions, we suggest that it is normal that most instigation events, or triggers, will tend to be large rather than insignificant. It normally takes a crisis of some kind before organisations will change existing processes and work practices. This is the basis of the punctuated equilibrium model of alignment (Sabherwal, Hirschheim & Goles 2003). A very senior IS manager within a large Australian financial institution provided an example. An organisation he previously worked for was a newly formed retail bank and under Australian law it was protected from takeover bids for a period of 10 years after incorporation. That period had nearly expired and the bank needed to triple its share price within a short period to maintain its independence. The CEO effectively 'locked' 300 senior managers from all functional units within a room for three months. They were told to come up with suggestions how the bank could increase its share price. Some 3,000 recommendations were made. These were then grouped together to form projects that were then prioritised with many being accepted by the executive and implemented. During this period of time both business and IS managers learned a shared system of meaning that led to shared domain knowledge and a resolution of shared problems. The bank managed to lift its share price to the required level within the required time.

A result of this experience was that both IS and business managers continued to collaborate as they
had changed their beliefs and attitudes towards each other. When new business projects were contemplated IS managers were immediately invited to participate and actively questioned on how IS could contribute to project success. A side effect was that IS projects associated with these business projects were adequately resourced and headed by a business sponsor. That is, the IS projects had senior management buy in (Teo & Ang 1999).

As previously described, positive feedback loops can form either virtuous or vicious cycles. The previous two examples provided evidence of a trigger tipping a vicious cycle into a virtuous cycle. Unfortunately the opposite is also quite possible as described by a very senior IS manager of a large Australian financial institution:

*a lot of that is based on our history, back when a number of events occurred in the early 90’s [this organisation had a major IT project failure during this period which, together with a number of unrelated poor business decisions, almost led to its bankruptcy]. Confidence in IT was lost and so a lot of autonomy was removed from the IT organisation and so the account [function] basically came in to drive IT and took a lot of the business management out of it. A lot of that appropriate risk taking out of it, out of the IT organisation. So that’s why at the moment it’s like ‘Here’s a project. Fill that order and deliver something’.*

Changing this situation is now difficult. The two participants from this organisation had been given this task. Their assessment of their success at the time of interview was:

*Improving! Some of the business units have created their own IT areas which are not part of IT because they were not happy with the service being provided to them. ...others are quite dependent on IT [group] and the relationships are improving, I think, over the last 12 months... We have put on 4 business unit CIO’s who are there to work directly with the business unit heads to improve relationships and the services. So, I would have to say that it is improving from a pretty poor base in the first place.*
Changing the behaviour of a positive feedback loop can be challenging in the extreme. Since the completion of this study the senior executive of the above firm have reversed the actions of the two IS managers, firmly re-establishing the IS function as a cost centre. One of the IS managers interviewed for this study no longer works for the organisation. This is another example of path dependency (Lewin & Volberda 1999). Changing the status quo will always be difficult, suggesting that path dependency and history are vitally important when considering the co-evolution of IS and business strategies.

**Implications**
The data would suggest that the most successful instigating events pushing for closer alignment between business and IS strategies are large, have the support of management and are often the result of an organisational crisis of some kind. This is the reasoning behind the punctuated equilibrium model of alignment (Sabherwal, Hirschheim & Goles 2003). However, confirmation of this hypothesis requires further research. Successful insignificant instigating events, such as the approach outlined above by the partner in the law firm, are possible, but all managers must be aware of an approach by another to change the current situation. A contribution of this paper is to make managers aware of the effects of their decisions and actions on collaboration and alignment.

A feature of positive feedback loops is that the value of variables within them tend to exhibit exponential growth (Sterman 2000). This means any initial changes in the behavior of the system are almost imperceptible, especially where the instigating event is insignificant. There are two ramifications of this.

Firstly, seemingly insignificant events early in an organisation's life will more than likely determine the role of IS within that organisation. For example, Gramignoli, Ravarini & Tagliavini (1999) noted that the principals of small to medium enterprises normally choose IT managers according to their technical expertise, not their ability to provide commercial and strategic input to the firm. Additionally, the senior business manager within this type of firm tends not to have an
understanding of the strategic use of IT (Gramignoli, Ravarini & Tagliavini 1999). This is a trigger event, suggesting that the principal sees no reason to communicate and collaborate with his IT manager on business issues. From this we hypothesise that poor IS/business relationships, collaboration, alignment and IS innovation are the norm in these organisations and that, due to the effect of the positive feedback loop described in the previous section, this situation is maintained over time. This hypothesis is partly supported by earlier research (Thong & Yap 1995).

Secondly, any attempts by an individual to change this situation is more than likely to be rejected by others. The large Australian financial organisation in our study was an example of this. However, if the recipient is amenable to a change in the situation the effect is likely to be unnoticed by others within the organisation. It is only over a considerable time, with more people becoming enrolled in the adoption of a new way of operating, that an overall change can be seen. The law firm is an example of this situation. Improving collaboration from the bottom up is possible, but it is likely to experience many rejections and this takes considerable time.

The diagram shown in Figure 1 can explain the anomalies observed by Sabherwal et al. (2003) when they considered alignment from a punctuated equilibrium perspective. There is no guarantee that the underlying beliefs, attitudes and perception of IS contained within IS Status will change during a crisis. People may just work harder, rather than differently to overcome the crisis. At the end of the crisis either the system described in Figure 1 has been tipped from one cycle to another, or the status quo will re-assert itself. The example of the Australian general retail bank describes a crisis that did result in a dramatic change in IS Status and the overall behaviour of the system. Everything in the system is now reinforcing the new context.

The loops described in Figure 1 operate at all levels of an organisation: executive, senior management and operational. It is quite possible, although unlikely, that the major positive feedback loops in Figure 1 could exhibit virtuous tendencies at an executive level, but vicious tendencies at an operational level. A more likely scenario is a generally virtuous cycle operating at all levels of the organisation. Although communication, trust and collaboration may be evident, overall
alignment may not be. At an executive level, strategies and plans may be aligned. However, many operational level business managers are not implementing business strategies as intended due to the performance metrics applied to them and other factors (Kerr 2003). Operational level IS managers then support the goals and actions of their business peers and not the overall business and IS strategies. This phenomenon has been observed by other researchers but not identified as such (Nordstrom & Soderstrom 2003).

The data from this study indicates that both business and IS managers within an organisation 'learn' to communicate, trust each other, develop a shared system of meaning and shared domain knowledge and then to collaborate. That is, their capabilities co-evolve. The opposite is just as possible. They may make an unconscious decision not to collaborate. In either case the deviance amplification behaviour of the positive feedback loops within the alignment system reinforce the situation. This, then, affects alignment as it has been conclusively demonstrated that the development of shared domain knowledge, vision and collaboration between CIOs and CEOs is essential for an improvement in alignment (Chan, 2002; Nelson & Cooprider 1996; Preston & Karahanna 2009; Reich & Benbasat 2000). The diagram developed here also explains the intractable nature of alignment and why it has remained a major issue for CIOs for so long (Luftman & McLean 2004).

It has previously been argued that alignment has been poorly defined and that its measurement is almost impossible (Benbya & McKelvey 2006a). To overcome this Luftman (Luftman 2001; Luftman & Kempaiah 2007) provides a means of assessing the alignment maturity of an organisation via the use of six criteria (communications, value, governance, partnership, scope and architecture, and skills). These are measured independently but any interaction between criteria is not considered. At a conceptual level the diagram in Figure 1 includes most of the criteria identified by Luftman (2001). Likewise, it includes the factors of alignment identified by Chan (2002), Reich & Benbasat (2000), Nelson and Cooprider (1996), Luftman (1999) and others. The assumption is that if collaboration improves then the other criteria of alignment used by Luftman
and the enablers and inhibitors of alignment also tend to improve. Our diagram, then, resolves one of the issues of Luftman's work. He is able to assess the maturity of alignment within an organisation but is unable to provide a way forward to improve that maturity. It also suggests that the level of collaboration between IS and business managers and units may also provide an initial indication of the level of alignment within an organisation. Similarly, the work presented here indicates that future definitions of alignment should be couched in terms of a process that indicates the complexity of the environment in which alignment occurs. This reflects the definition of alignment by Benbya & McKelvey (2006) provided earlier.

As a discipline, IS tends to reduce the complexity of a problem situation to enable rigorous investigation of linear causality and correlation between a small number of variables (Orlikowski & Baroudi 1991). Reducing complexity also allows the identification and ranking of the factors affecting alignment (Chan, Y.E. 2002; Luftman, Papp & Brier 1999; Teo & Ang 1999). However the dominant research paradigm tends to ignore the possibility and effect of recursive relationships between variables even when it is suspected they exist (Reich & Benbasat 2000), nor does it allow the investigation of the mechanisms of alignment. Many authors now agree that alignment, and in particular strategic alignment, is a process rather than a state, but we do not fully understand that process (Benbya & McKelvey 2006a). That is, we have difficulty reassembling the individual pieces of research that have resulted from a reductionist approach to gain a full understanding of the whole (Campbell, Kay & Avison 2005).

By investigating alignment using a lens that incorporates a co-evolutionary perspective we have developed a framework on which other quantitative research could be placed. This, then, may allow an understanding of both the pieces and the whole. Note, however, that the framework in the diagram is not complete. It is an initial understanding of the alignment process. For example, our data would indicate that where IS Status is high then Current IT resources are more likely to be adequate for any given project. This particular feedback link may then provide the means to improve Perceived IT success in the long term, overcoming the effects of the balancing feedback
loop “Never Get Ahead.” In causal-loop terminology it is possible the positive feedback loop “More of the Same” will gain dominance over the negative feedback loop “Never get Ahead.” This needs further investigation. It is also inevitable that researchers will find other causal links affecting alignment that could be incorporated into the model.

We believe that any future alignment research should acknowledge recursive relationships between factors if they are suspected even if they are not directly investigated. This immediately identifies future research rather than claiming that any causality is uni-directional which may inhibit our understanding. As an aside we also contend that a similar approach to that used here, embracing complexity and assuming a co-evolutionary or systems view, could be effectively employed in research into IT innovation, governance, project management and other IS areas.

Finally, we must highlight a weakness in this, and other, alignment research. The participants of this research concentrated on the development of relationships and trust between individuals. This is reflected in the business and IS literature that considers, for example, relationships and trust between CEOs and CIOs (see, for example, Feeny, Edwards & Simpson 1992). However there is a difference between trust between two people and trust between groups of people that is rarely explored in the literature (Zaheer, McEvity & Perrone 1998). Although Zaheer et al (1998) investigated trust between organisations within a supply chain their work is equally applicable to units within a single organisation. Significantly they found that there is a direct relationship between inter-organisational trust (or intergroup trust in our context) and performance. They hypothesize that this is due to cooperation between units in exploring new information and coordination technologies as well as cooperation in product and process innovation. Conversely, they found that low levels of intergroup trust were associated with conflict and dysfunctional processes. Zaheer et al. (1998) also found that where intergroup trust is high it will withstand the exit of a significant actor as any new actor will be inculcated with a trusting attitude on joining the group. High levels of intergroup trust are often able to withstand setbacks such as a less than optimum project outcome.
The above is important for alignment. If intergroup trust exists then it is more likely that business and IS groups will collaborate to discover new ways in which existing technology can be used. They will tend to solve mutual problems rather than remain remote from each other. At the same time the trust will mitigate the effects of an occasional poor project performance. If a CIO who is working in this situation decides to leave for some reason it is likely that his or her replacement will more quickly develop a relationship with the other executive officers.

Also significantly, Zaheer et al (1998) discovered that trust between individuals had little direct impact on performance. It appears that individual trust is important during the development of group trust but does not have a direct impact on performance. But, personal trust is positively connected to “… attitudes, perceptions, and other cognitive constructs” (Dirks & Ferrin 2001, p. 455). That is, the situation where IS Status is low is unlikely to change until personal relationships and trust is developed between individuals in both groups. Earlier research indicates that most IS managers believe that their credibility and trustworthiness are a result of their technical ability (Bashein & Markus 1997). In particular, operational level IS managers within this study also indicated they spent most of their time attempting to increase their project performance to increase credibility even though admitting that they understood that developing relationships with business peers was more effective.

<table>
<thead>
<tr>
<th>Characteristic of Co-evolution</th>
<th>Example of application from model</th>
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<tbody>
<tr>
<td>Multi-level effects</td>
<td>IS managers align their actions to those of their peer business managers. This can result in many outcomes. For example, where collaboration exists it is quite possible that intended business and IS strategies are aligned via the collaboration and actions of the CIO and other executives. IS line managers then support the actions of their business peers. However, due to the performance measurement criteria placed on business managers, and other issues, implemented strategies may not reflect intended strategies.</td>
</tr>
<tr>
<td>Multi-directional causalities</td>
<td>The development of relationships between IS and business managers is dependent on their ability to communicate. However, as the relationship develops it encourages further communication. Similarly, a developing relationship can engender trust that then improves the relationship.</td>
</tr>
<tr>
<td>Non-linearity</td>
<td>The research presented here indicates that instead of variables being connected in a simple cause-effect logic of linear relationships they are, in fact, part of feedback loops. Examples are the loops Learning (or not), More of the Same, and Never get ahead included in the model.</td>
</tr>
</tbody>
</table>
Positive feedback

Also known as self-reinforcing feedback – it strengthens the existing situation. If IS Status is low, there is little incentive to communicate. Therefore relationships between IS and business managers tend not to develop, inhibiting a shared system of meaning, shared domain knowledge and collaboration. This then adversely impacts IS performance, supporting the organisation’s poor view of the IS function, and strengthens a low IS status.

Conversely, high IS Status encourages communication which will, after intermediary impacts through the feedback loop, improve IS Status even further. A feature of positive feedback loops is that they tend to exhibit exponential, or non-linear, growth (or decay).

Path and history dependencies

The effects of positive feedback loops ensures that the status quo tends to be strengthened over time. Where IS Status has historically been low it will be difficult for an IS manager to successfully instigate meaningful communication in an attempt to develop a relationship, shared domain knowledge and collaboration.

**TABLE 2** Co-evolution and strategic alignment.

We hypothesize that the level of trust and relationships developed between CEO and CIO may be necessary for the development of a shared vision and integrated organisational and IS strategies (Reich & Benbasat 2000), but that trust and relationships between IS and business groups may be necessary for the implementation of the vision and strategies. Zaheer et al’s (1998) work would indicate that trust developed between a CEO and CIO is a necessary but not sufficient condition for business and IS units to collaborate. There are two issues here: firstly, most IS research only considers trust and relationships between the CIO and other, usually CEO, executive officers. It generally ignores the development and effect of trust and relationships between the IS unit and other business units. The work of Zaheer et al. (1998) would therefore indicate that this is a significant gap in our understanding of collaboration and alignment between these two groups.

Secondly, they also observe that the development of group trust (in their case, inter-organisational trust) is poorly understood.

**Conclusion**

The research reported in this papers employed a grounded theory approach to investigate alignment.

Data were analysed using co-evolutionary theory as a lens to identify feedback loops of factors that affect the achievement of alignment. The result was a model that reflects the dynamic nature of the process of alignment. The causal-loop diagram presented in Figure 1 exhibits all the properties of co-evolution identified by Lewin & Volberda (1999); examples are summarized in Table 2.
THE CO-EVOLUTION OF STRATEGIC ALIGNMENT

Previous IS research papers utilising co-evolutionary theory are conceptual. We have provided a practical application of co-evolutionary theory. Using this theory we have demonstrated how a relationship between business and IS managers can develop over time, showing that the interaction of a number of variables will impact the ability of these managers to develop such relationships.

The diagram developed here then shows how relationships work through a number of other variables to impact collaboration. It is now clear that both IS and business managers must develop a shared system of meaning, shared domain knowledge and then apply these skills as they collaborate to resolve common problems and issues. Doing so impacts the perception held by the organisation of IS performance and eventually impacts the status of IS within the organisation. As IS status improves so there is more incentive for business managers to engage in communication with there IS peers, so completing a positive feedback loop.

Much of the earlier research into alignment can be fitted to the diagram of alignment presented in Figure 1 although this is far from complete. It does provide a framework for future research, enabling a more complete understanding of the alignment process and, specifically, strategic alignment.

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