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Re-conceiving Change Management: A Knowledge-based Perspective

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This paper argues that for us to advance our thinking on the management of change, it may be useful to re-conceive of change as a process of knowledge generation. For organisational transformation to occur, an organisation's members need to evolve new tacit knowledge about the way they interact both with each other and external stakeholders, and how they co-ordinate their activities. We use a case study of organisational transformation to illustrate how concepts from knowledge generation can be used to reframe some of the typical issues that arise, and make suggestions for practice.

Keywords: Change management, Culture change, Case study, Component knowledge, Architectural knowledge

Introduction

Many organisations, due to a decline in competitiveness, challenges from new entrants in their markets, or a perceived longer-term change in the nature of their industry, attempt to undertake transformational or strategic change – change that involves significant alteration to strategy, structures, systems, processes, and ultimately culture. However, there is still a high failure rate. Explanations offered for this often centre on culture and politics, or a misunderstanding of the dynamics of change. However, it is also possible that existing models do not adequately capture the complexity of the change process from the perspective of the change recipients, and we need to consider alternative theoretical perspectives to help us view change in different ways.

The central argument of this paper is that change can usefully be conceived of as a process of knowledge generation. Furthermore, there is a growing body of theory on organisational knowledge, incorporating a set of established concepts both for understanding the nature of knowledge in organisations and how new knowledge may be created and shared. Thus the concepts from this field may be able to offer some ideas on change could be 'managed' differently. The key to identifying change as a process of new knowledge creation is the link between culture and strategic change. At the root of organisational cultures are a set of shared assumptions and beliefs (Schein, 1985), or shared beliefs and *knowledge* (Nonaka and Takeuchi, 1995). The shared assumptions and beliefs can be likened to tacit knowledge, since they are taken-for-granted and rarely voiced explicitly. Individuals acquire them via a process of osmosis, by learning from others, when they start to work in an organisation (Sathe, 1983). These assumptions and beliefs underpin the routine and often unwritten and informal ways of behaving in an organisation. For strategic change to occur, the routines and their associated meanings have to evolve.

To think about strategic change in terms of knowledge generation challenges the way we conceive of change processes. This paper first sets out the case for viewing change management as a process of knowledge generation. It then presents a case study of organisational change that illustrates many of the typical issues encountered during planned organisational transitions, and uses some of the central con-

cepts from the field of organisational knowledge to analyse the case. We show that concepts such as component and architectural knowledge (Henderson and Clark, 1990), codification and diffusion, redundancy (Nonaka and Takeuchi, 1995), and enabling context (Von Krogh *et al.*, 2000) can be used to account for some of the issues that arise as change progresses. This analysis is extended to consider the implications for managing change in organisations.

Strategic Change as a Process of Knowledge Creation

How strategic change occurs in organisations has attracted much interest over the last two to three decades, with many competing explanations and models. There is a strong focus on culture and politics as significant impediments to change (Pettigrew, 1985; Johnson, 1987; Dawson, 1994). Transformational change is not something that should be undertaken lightly. Yet managers of organisations continue to face circumstances in which they need to lead change on an intentional basis, be it to keep pace with fashions and fads such as total quality and business process re-engineering, or to attempt to reverse a decline in competitiveness. Burnes (2000) cites a series of surveys conducted throughout the 1990s that show organisations undergoing a range of changes such as downsizing, corporate restructuring, and culture change. Many managers want to transform their organisations on a planned basis. And history would suggest that some organisations achieve this. Well known examples include British Airways and SAS (Scandinavian Airlines) in the 1980s, GE and ASDA (the British supermarket) in the 1990s. On the other hand, there is also a high failure rate for change processes. Beer and Nohria (2000) suggest a failure rate as high as 70 per cent for organisational change initiatives in general.

Increasingly, the feasibility of 'managing' change is being questioned. We have recognised the central role of sensemaking in change (Isabella, 1990), and how this challenges the way we conceive of managing change. Change cannot be reified as something 'done' to individuals (Balogun and Johnson, 1998), since individuals play an intrinsic role in shaping change outcomes. The extent to which culture change can be consciously managed is questionable (Willmott, 1993). This does not mean that organisational cultures cannot change, but rather that they may change in a more emergent and evolutionary way than would be suggested by planned models of change (Ogbanna and Harris, 1998). Yet in practice it is still common for change to be seen as something that can be placed on individuals. Change is about issuing objectives and instructions and 'explaining' to individuals how they need to change.

An alternative perspective is to view change management as a form of knowledge generation. It is widely accepted that there are two levels of knowledge – explicit knowledge and tacit knowledge. Explicit knowledge is easy for individuals to communicate and share via words and numbers. It can, therefore, be encoded or explained and passed on. Tacit knowledge is personal and hard to communicate with others since it is hard to formalise or write down (Nonaka, 1991). Tacit knowledge may include insight and intuition, and is 'deeply rooted in an individual's action and experience, as well as in the ideals, values or emotions he or she embraces' (Nonaka and Takeuchi, 1995, p. 8). It is context specific. Whereas explicit knowledge is to do with 'know what', tacit knowledge is about 'know how' (Seeley Brown and Duguid, 2001). 'Know how' is embedded in action or social practice and is hard to get at outside of the context in which work is done and working life is played out (Suchman, 1987; Lave and Wenger, 1991; Seeley Brown and Duguid, 2001). This leads to the notion that tacit knowledge needs to be converted into explicit knowledge to be shared outside a community of practice (Nonaka and Takeuchi, 1995). However, explicit knowledge is only useful when the tacit knowledge to make it work is also known (Seeley Brown and Duguid, 2001).

Nonaka (1991) argues that Western management still favours the machine metaphor for organisations, which leads to a view of knowledge as formal and systematic, captured in codified procedures. This can be seen in the way many organisations conceive of change and therefore communication during change. At one level it is recognised that individuals need to translate desired new organisational ways of working into specifics for their own personal ways of working. However, this is not equated with the need for individuals to develop new tacit knowledge or knowhow about the way they do their work and carry out their roles. The tacit component of the knowledge which individuals have about the way they work and interact together and carry out their jobs is not recognised in the way it would be if taking an organisational knowledge perspective. Change is not seen to involve change recipients in a process of innovation and creativity, or even experimentation, in which they need to somehow surface their existing tacit and embedded representation of their work and their organisation and alter it to create a new (tacit) way of working aligned with the new goals and vision for the organisation. Recipients are conceived of in a passive sense, summed up by the use of the term 'recipients', rather than as active creators and shapers of the future organisation.

A knowledge-based perspective on organisations is consistent with the view of organisations as cultures (Smircich, 1983). Culture is most commonly defined after Schein (1985) as the set of assumptions and beliefs held in common and shared by an organisation's members. Culture is 'a stock of knowledge that has been codified into a pattern of recipes for

handling situations, then very often with time and routine they become tacit and taken for granted and form the schemas which drive action' (Colville *et al.*, 1993, p. 559). It is about tacit knowledge. The taken-for-granted assumptions and beliefs underpin the routine and often unwritten and informal ways of behaving in an organisation. For change to occur in organisations, the routines and their associated meanings have to evolve. This is consistent with evolving new, shared tacit knowledge about the way we do things around here, and how organisational activities are co-ordinated and integrated. It is necessary to somehow surface and change the knowledge of embedded social practices and behaviours.

Yet we don't often think about strategic change in these terms. Studies of organisational culture recognise knowledge as important, but have not given it sufficient attention (Nonaka and Takeuchi, 1995). The question is, therefore, if we can understand change as a process of knowledge generation, what can we learn about change from the growing body of work on organisational knowledge? How can the concepts from the field of organisational knowledge that have influenced the strategic agenda (see Table 1 for a summary) help us to re-conceive of the way we think about change management?

Concepts of Organisational Knowledge

Although we talk about change as a learning process, the change literature has not addressed the different types of individual knowledge that needs to change as part of organisational change. The divide into tacit and explicit knowledge is only one categorisation of knowledge, another is *component* and *architectural knowledge* . From this perspective knowledge can be seen as a system of interlinking elements or subsystems. The subsystems can be described as domains of component knowledge. Within each domain an area of knowledge is needed to undertake tasks and produce outcomes. Within an organisation, for example, component knowledge of marketing, human resource management, operations and finance would be required to create a functioning organisation. Architectural knowledge can be seen as the knowledge that connects together the different aspects of component knowledge needed for an organisation to function. An example would be the knowledge that connects domains of marketing and finance in order to create not just marketing or financial capability, but also to be able to link the two to create viable marketing plans. Architectural Knowledge can also be grouped at differing levels of analysis such as component-specific communities, firms and system-level communities (Jenkins and Floyd, 2001). Whilst we could consider the architectural knowledge between marketing and finance, we could alternatively have considered the architectural knowledge within the domain of marketing such as the linkages between promotional activity, pricing strategy and brand positioning. Architectural knowledge is about the routines of the organisation, and how individuals in an organisation work together. We can see that both these types of knowledge – component and architectural may need to change as part of organisational change.

Theories of organisational knowledge also consider how knowledge is shared within an organisation. *Processes of codification and diffusion* are concerned with the ease with which knowledge can be transferred. Codifiability sees knowledge as structured into a series of categories (Boisot, 1998) or rules

Table 1 Concepts of Organisational Knowledge

Concept	Description of Concept
Architectural vs component knowledge	Component knowledge is a particular domain of knowledge. Within each domain an area of knowledge, such as marketing, is needed to undertake tasks and produce outcomes. Architectural knowledge can be seen as the knowledge that connects together differing aspects of component knowledge needed for an organisation to function. It is concerned with how domains of knowledge are linked and used together – about interactions across boundaries and how people work together in practice.
Absorptive capacity	Absorptive capacity is to do with the ability to absorb new knowledge. Absorptive capacity will be higher when there is already prior knowledge of a particular specialist area, making it easier to absorb new knowledge about this specialism.
Knowledge codification and diffusion	Knowledge codification and diffusion refers to the mechanisms by which knowledge becomes shared. Codification refers to the process by which knowledge is translated into a form in which it can be more easily shared, and diffusion refers to the means by which this knowledge is then communicated to others.
Redundancy	Redundancy refers to the use or creation of overlapping information about business activities, management responsibilities, and the company as a whole by sharing information across teams, functions and departments. Different and overlapping information is used to encourage cross-learning and aid the generation of new ideas.
Enabling context	An enabling context is one that encourages acting – an environment that encourages individuals to take initiatives and learn within a common vision or purposeful intent.

(Kogut and Zander, 1992), which allow it to be more easily communicated. Codification creates a set of coherent standards that allow others to understand and therefore potentially replicate, for example, a particular technology. Codification reduces the cost of communication, allowing personal knowledge to be transmitted effectively within close-knit groups (Katz and Kahn, 1966). The process of codification could, therefore, be argued to be an essential organisational process and one that enables the firm to both learn and grow, since without such mechanisms knowledge of processes, systems and technologies could not be shared in a firm. Similarly, at times of change, how does knowledge about new ways of behaving and doing things that are consistent with the aims of change develop and get shared? If change is a process of new knowledge generation, this becomes a critical question. A further relevant concept here is *absorptive capacity*. Absorptive capacity suggests that the ability to absorb new knowledge is enhanced by prior knowledge in a particular specialist area. It enables organisations to identify the value of new knowledge more effectively than organisations with little prior knowledge.

Redundancy is argued to be a prerequisite for new knowledge generation. Redundancy refers to the existence of information that goes beyond the immediate operational requirements of organisational members. It is about deliberately creating overlapping information about business activities, management responsibilities, and the company as a whole by sharing information across teams, functions and departments. For some, the term 'redundancy' with its connotation of unnecessary duplication and waste may sound unappealing, particularly following on from the period of downsizing and business process re-engineering both of which are all about cost cutting and removing duplication and waste. However, the principle of redundancy of information encourages frequent communication and dialogue, which helps to create 'common cognitive ground' (Nonaka and Takeuchi, 1995, p. 14) among employees and thus facilitates the transfer of tacit knowledge. We know from research on cognition and change that individuals develop new shared ways of understanding during change by processes of social interaction (Isabella, 1990; Balogun and Johnson, 1998). Thus the concept of redundancy would appear to be relevant to change situations.

Finally, another concept that may help us advance our thinking on change is that of the *enabling context*, which is about creating an environment for *acting*. This differs from the emphasis in the change management literature that is often more about prescribing a script of actions in terms of what *should* be done. Managing conversations is the most critical of the five knowledge enablers, because it is about creating the intensive and interactive dialogues required to create new knowledge, as opposed to achieving knowledge confirmation, which most change management communication seminars are designed to do. An important distinction is the difference between learning and sharing *existing* tacit knowledge which can be achieved via situated learning within communities of practice (Lave and Wenger, 1991) and developing *new* tacit knowledge about the way to do things as is often required in change situations. The concept of enabling context offers an alternative perspective on the responsibilities of those leading change initiatives since it suggests that one of their functions has to be the creation of such a context.

We argue here that these concepts, to do with the type of knowledge (architectural versus component), how knowledge is shared and communicated (knowledge codification and diffusion, absorptive capacity, and redundancy), and how knowledge development is facilitated (enabling context), can be used to analyse the means used to manage change in the following case study and the typical change management problems encountered.

A Case Study: Change Management as Knowledge Generation?

In order to examine how concepts from the field of organisational knowledge may be able to provide us with alternative ways of viewing the issues that arise during change we use a case-based perspective to match patterns in the data with theoretical explanations (Yin, 1994). The case is of an engineering organisation, Design Co. Design Co. is a false name used to protect the identity of the organisation. The case is based on a series of interviews with senior managers, middle managers and non-managerial engineering staff in July 2000, about 18 months into the change process, and also documentary evidence. The interviews were focussed primarily on the 'Technical Directorate', the traditional engineering core of the organisation, and the part of the organisation most challenged by the changes.

The purpose of the following example is to illustrate common problems associated with change implementation. It is not meant to be an in-depth case analysis. The case illustrates typical change management problems – resistance from historically powerful groups, unhappiness with communication, and slow realisation of the extent of change required. Whilst this is not novel from a change management perspective, it provides a concrete example to work on which illustrates the relevance of the organisational knowledge concepts we are examining.

Design Co.

Design Co. is a division of a larger parent organisation that provides engineering solutions. The

division was established as a standalone business with its own board as recently as 1999. It was formed from two departments which operated primarily as engineering design internal service units within the parent company. The newly formed division was set tough growth targets. It was to offer an integrated design service and achieve the growth targets by transforming from an engineering focussed organisation with a large proportion of its work coming from within the parent group, to a more entrepreneurial engineering services company with more work from external customers. The division was re-branded as Design Co. to give it a separate identity from the parent company in March 2000.

Structure

One of the first change priorities was to establish an infrastructure to deliver growth on a more planned basis in a less buoyant market in which it would not be possible to maintain historic growth rates without dedicated sales and marketing resources. The traditional hierarchical pyramid was replaced with a matrix, team based structure. Assessment centres were used to pick people for new positions, which challenged the traditional promotion mechanism of 'this person should do that'. The new infrastructure also required new people. Design Co. had people with good technical skills, but they lacked managerial capabilities. A new board was put in place and about 20 new reports to the board level were brought in. With the board in place, an account management strategy was introduced and account directors established. Other older managers were asked to leave, or redeployed. Some left by mutual agreement having recognised that they did not have the skills required by Design Co. For others, the process was more painful.

There was some resistance to new staff. Engineers used to run the company (and in some instances appeared to believe they still could and should). They tended to view the new staff within sales and marketing and HR as non value-adding overheads, who were leading the company too far way from its true roots in engineering:

> I'll be quite frank here, it doesn't help with the product that you actually deliver. I'd rather have a draftsman on engineering to produce more work to earn more money than somebody that's just there to help and assist but doesn't actually bring in any turnover for the company ... there's got to be a balance. You've got to remember where the roots are and what we actually produce at the end of the day. (Middle manager)

The infrastructure changes with more managers at the senior level and in central departments such as HR and finance were for many the most tangible impact of the changes:

> As a job it hasn't really changed much but there are an awful lot more managers around and there are an awful lot more offices … I still have the same desk as I had before, I still do a similar job, and I still answer to the same people. (Operating core)

Culture

It was recognised that the desired transformation necessitated changes in behaviour and attitudes, particularly from the engineers who had to date prided themselves on engineering excellence. There was a need to change the organisation from a traditional, hierarchical manufacturer to a more commercial, customer-oriented organisation with more team-based working. The overall culture of Design Co. was very much about engineering and therefore also very macho, conservative and male dominated, 'women are expected to either make the tea or type letters', which caused problems for some of the new female managers. Traditionally work was passed straight from an engineer at the customer site to a Design Co. engineer – sales were based on customer/engineer relationships. There was no total project cost agreed. Work was done on the basis of 'power by the hour'. An hourly rate was agreed with a customer, and Design Co. would work however many hours were necessary to deliver the project. A shift was required to fixed-price contracting:

> What you're now trying to do is say 'We want this job done, we want to get it finished, we want to get it finished sooner because the sooner we finish it the more profit we make'. So you're actually looking for them to do the job more quickly as opposed to think about ways of taking more hours from your customer. (Senior manager)

For some people within the business the old culture of more hours equals more income was deeply engrained since it was the way engineering businesses had always worked:

> So they (original employees) took that culture which is 50 years old with them, and have spent the last 15 years with that same culture so it's a very established culture. These guys' fathers did it, and in some cases their grandfathers did it. (Senior manager)

It was recognised that the changes being put in were actually quite threatening to the workforce:

> The biggest old school part of it is the engineering side. The new management have come in, and they see us as a cost, so unless you're an engineer you're an overhead… they are quite comfortable, nothing has changed for years … it has been quite a small single site organisation where everybody knows each other and suddenly things have changed, we are looking at performance management … instead of well you know so and so, so you can be the next principal engineer. (Senior manager)

Whilst the senior managers clearly saw the need for a fundamental shift in the culture, this was not recognised by others. Some saw the need to move from a small, family way of operating as the organisation grew, but there was little comprehension of the extent to which attitudes needed to change. Some also saw the shift from being engineering led to a

more managed organisation with a more aggressive approach to sales:

> The change from the company two years ago just before we started to expand, was that it seemed to be a group of engineers trying to do a job with support from management but now we seem to be more modularised, not taking the lead anymore, we are more the resource. (Operating core)

It was also suggested that the customer base provided a barrier to change since the customer culture was the culture the Design Co. staff also expected to work in:

> It's interesting that in the main the people we deal with in the customer base think the same way because they're all big company engineering guys and they work power by the hour internally effectively … So all these guys are interfacing all the time, drinking at night in the pubs because they live close to each other, and where we hire, others are from that sort of environment and they're our customers. (Senior manager)

However, other staff liked the new structure and management team. The culture was described as one likely to attract ambitious staff because of the willingness to keep up to date with the technology, and the scope for staff to move between jobs and progress.

Change Initiatives

To support the desired changes, new performance management systems were put in place, with an element of pay linked to the achievement of personal objectives. All first and second line managers were given performance objectives, and appraisals were introduced. Projects were set up to look at remuneration, compensation and benefits in general. Focus groups were used to help develop new promotion and reward mechanisms which moved away from the traditional grade-based system and focussed more on the value people add.

Different promotion paths were developed for the engineers. Design Co. employed many contractors. An issue for the organisation was that engineers often chose to become contractors rather than remaining as Design Co. employees because the only career path was to become a manager. Furthermore, some very good engineers did not make good managers. A new parallel career ladder was put in place to enable engineers to take a management route or become technical experts – and to swap between the two. At the same time, the opportunity was taken to devolve managerial responsibility. Team leaders were made more responsible for people management. Management development was also provided for managers lacking man management skills. To address the shortage of engineers given the desired growth rates, a graduate development scheme was also introduced. Another initiative to grow the number of engineers in the way needed to expand the business was to recruit people from different engineering disciplines, but with suitable skills. The newer recruits appeared to be more positive about change, speaking of the opportunities they perceived within the company, than the longer-serving staff. In general there was a split between the newer and older staff in terms of receptivity to change:

> I would say that the people who are positive on the technical staff are probably the people coming in and they're quite excited about change. They've got ambitions, they want to see things move. The older people who've been around a lot more, see the changes that the company's tried to do fall flat by doing it the wrong way they're less receptive to change because they've seen it before. (Middle manager)

Finally, there was a need for managers to become more entrepreneurial. The business unit managers needed to seek to grow the business within their geographic locale instead of acting as office managers more concerned with administration. To help with this, an entrepreneurship programme was under development.

Communication

Initiatives were put in place to improve communications. The business plan for 2000 was communicated along with the objectives for the year. The results of an attitude survey in January and February were communicated. In March 2000 there was a roadshow to launch the re-branding, and the half-yearly results were communicated. The intent was to achieve cascaded communication within the organisation. Managers were responsible for taking communications they received and sharing them with their teams:

> We have a core brief which goes onto the notice board. We rely on managers to hold team meetings and brief their staff which they don't do and that is a critical thing. We need to get managers holding these team meetings and making them participative and two way and it is just not happening. (Senior manager)

Although staff thought that there was increasing evidence that the management team were listening to staff views, with, for example, actions taken after the staff survey in response to the results, middle managers and the operating core generally felt that communication was not good enough. They saw few formal means of communication within the organisation now the monthly team briefing mechanism no longer operated. There was little acknowledgement of the new middle manager communication responsibilities:

> What they've actually been replaced with now is a monthly brief which gets posted on the notice board. No-one was told that they were actually there, it's just that we were passing and glanced, and noticed it was there. (Middle manager)

The operating core were happier with a new intranet system put in place as a means of communication

than the middle managers. The office grapevine was also an important source of news. The perceived lack of communication also led to a perception that there was little consultation, and that change was directive:

> For the re-branding it was a year before when they said we would be re-branded but to carry on using the company name for now. That was all we heard until literally 2 weeks before we got re-branded which was a massive event. I don't know if they try to keep us in the dark but it sometimes feels like we could be a little more involved in what is going to happen. (Operating core)

Discussion: Applying Knowledge Concepts to Change Management at Design Co.

Component and Architectural Knowledge

The Design Co. case shows how old knowledge (in this case the engineering base) is challenged at times of change by the need for the organisation to do something different (in this case to become more entrepreneurial and market focused). The case reveals a number of issues concerning component and architectural knowledge at the organisational level. The engineers had specific component knowledge to do with the engineering industry – and within that particular engineers had different specialisms. However, they also had architectural knowledge about the way they worked together in teams and projects, about the way Design Co. operated as an organisation, about the way they worked and interacted with their customers, and for that matter, about the way they won work from the customers and managed and charged that work (more hours equals more income). Much of this architectural knowledge was captured in taken-for-grated and routine ways of working – and was shared with the customers becoming not just organisational but also inter-organisational architectural knowledge.

The aim to transform the company from an engineering focus with a large proportion of work coming from within the parent group, to a more entrepreneurial and commercial engineering services company with more work from external customers, not just within their core sector, but also in new sectors, challenged both the component and architectural knowledge bases. First, a commercial and entrepreneurial organisation required new component knowledge about functions such as sales, marketing and human resources. However, the intent also challenged the architectural knowledge of the engineers since it implied a new way of working both within the organisation, with each other, and with their customers. For example, it required a move from engineering 'the best' as defined by the engineer on a cost plus basis, to designing things that are fit for purpose, with pre-defined costing. The account-based structure, with account directors owning whole companies as customers, as opposed to engineers having special relationships with particular engineers at a customer site, challenged both component knowledge on making sales and architectural knowledge about how customer relationships were managed.

The architectural knowledge about the way Design Co. currently worked was embedded in a series of intra- and inter-organisational relationships. Their existing customers, who they not only worked with, but also historically socialised with, were other engineers working the same way, and therefore they formed part of the same component specific community (Jenkins and Floyd, 2001). The relationships and socialisation with customers (other engineers) acted as an on-going and reinforcing diffusion mechanism for old ways of operating. The nature of the relationships here are important as they are informal, long-term and social. Nonaka and Takeuchi (1995) and Lave and Wenger (1991) suggest that such relationships within communities provide for a form of socialisation which is important in exchanging tacit knowledge. Therefore, even the resistance of engineers can be re-framed in knowledge terms. It can be seen to stem from the challenge to the dominant core of deeply embedded component knowledge (engineering) from the new architecture which seeks to integrate it more closely with 'sales/marketing/commercial'-based knowledge. Resistance to new people, for example, HR, may have stemmed from a lack of credibility – they didn't have the appropriate 'component' knowledge.

Some of these knowledge disparities were recognised and certain initiatives were taken to address them. New component knowledge in sales, marketing, finance, HR and general management were bought into the organisation with new people. The importance of both component engineering knowledge and architectural knowledge about how to manage people with specialist component knowledge in teams and projects was recognised and captured in the new dual career path for engineers. Training was put in place to remedy shortages in management component knowledge. However, these initiatives did not address the need for the development of new architectural knowledge about the way Design Co. now operated, and the new way the engineers now needed to operate, and for that matter their *identity* as engineers within Design Co. For example, engineers were clearly trying to make sense of how their roles were changing, 'we are now just a resource', but as yet had no picture of what the future was about. Architectural knowledge is concerned with linkages and interfaces between components. It would therefore require a specific focus on the interactions between, for example, sales and engineering, engineering and customers, and engineers and their team leaders, for new knowledge to develop.

Absorptive Capacity

Design Co. was using the principle of absorptive capacity with the new engineers it recruited (appropriate technical knowledge although currently within a different domain), and some of the managers they recruited. For example, the new manager of the technical directorate came from the main internal customer of Design Co. and understood the architectural knowledge the engineers were working from, and something about the component knowledge of the customer base. However, the application of this principle to the Design Co. situation provides an explanation about the depth of resistance encountered in some of the engineers. The engineers needed to acquire both new architectural knowledge and some elements of component knowledge (such as sales and general management). Given their length of service and their embeddedness within customer relationships operating off similar architectural knowledge, they had no prior knowledge of such working circumstances to ease their absorption of the new knowledge they were being asked to take on board. Their individual capability to undertake change was lower given their lack of previous experience of such changes.

Codification and Diffusion

The issue in change is to do with the codification and diffusion of the new architectural and component knowledge necessary for change to occur, rather than existing knowledge. First individual groups themselves need to generate new knowledge. For example, within the Design Co. case – what does it mean for the engineers to move away from power by the hour? How does this change the relationship with the customers? And how does that change the way the engineers work? There is a need for new component knowledge about appropriate tendering systems and mechanisms, for example, but also new architectural knowledge about the changed customer relationship and the way projects are managed.

This illustrates that there is also scope for sharing during change on an on-going basis between those who have, for want of a better term, mastered new architectural and component knowledge and those who haven't. In other words, those who have developed new procedures, systems or routines that work, can share them with others who have not progressed so far. Some of this sharing can occur in a formal way such as training. Other knowledge may be more tacit and harder to share. Furthermore, it might be that new knowledge about what the changes, such as the new Design Co. structure, mean and how it works in practice needs to be generated within some sort of pilot group, and then shared. Knowledge generation theories provide ideas on how this can be done.

When Nonaka and Takeuchi (1995) write about knowledge generation, there are certain consistent themes they return to. One of the themes is of individuals working intensively in groups, with much face-to-face interaction and dialogue, and out of work socialisation in which the exchange of ideas continues in more social settings. 'Knowledge has to be built on its own, frequently requiring intensive and laborious interaction among members of the organisation' (Nonaka and Takeuchi, 1995, p. 10). The argument is that knowledge is created by the interactions between individuals. Individual knowledge has to be made explicit and shared in some way to encourage a more shared way of seeing things and to allow the individual knowledge via processes of group challenge, discussion and dialogue to become something more – to mutate and provide ideas. In change situations, existing individual knowledge might be about the way things are currently done, including existing taken-for-granted routine ways of working and knowledge, that need to be aired and explored before it can be understood how these practices need to be altered to meet the aims of the changes.

One counter argument is that this view is a little simplistic. Others argue that is it only possible to get at deeply-held tacit knowledge about the way an individual does their work or thinks about their work within the context of operation (Lave and Wenger, 1991). Nonaka and Takeuchi (1995) put emphasis on the role of conflict and disagreement that occurs as part of dialogue and discussion as the enabler that surfaces for examination of existing premises and encourages group members to make sense of experiences in new ways. A second theme that recurs continuously, in addition to the use of dialogue, is the use of 'figurative language' or metaphor and analogy. The role of leaders is to provide a vision which indicates appropriate intent, without saying explicitly 'this is what you will do'. The vision then generates discussion to understand what this means for individuals and what they do.

This all sounds rather abstract. However, what we can see from Design Co., and many other cases on change, is that there is a lack of opportunity for members of the organisation to get together in small groups and on a face-to-face basis engage in dialogue and discussion with each other as to the meaning of the changes and the implications for themselves. Furthermore, there is evidence that organisations that do engage in such initiatives get better commitment to change (Hope and Hendry, 1995). Communication is normally factual and top-down. It focuses on explicit knowledge. If we return to the premise of this paper, that much of change is about developing new tacit knowledge, such communication mechanisms on their own, however many of them there are, will be inadequate. In particular, this is an issue where areas of new architectural knowledge need to develop between groups of people that do not naturally work together a lot – such as at Design Co. the engineers and the new marketing and sales people. Without

interventions to facilitate a dialogue about how they will work together, how can they generate effective new organisational routines? Thus the theories of codification and diffusion offer a challenge to the way we conceive of communication during change, and potentially offer us ideas about the types of interventions and processes we could use to generate the new required areas of knowledge.

It must also be remembered that the individuals brought in to sales and marketing are unlikely to share the component knowledge of the engineers. Therefore, team working to share knowledge is not just about the engineers and marketeers deciding on new ways of working together, but also about enabling new staff to learn about how the engineers work and what they can sell. Furthermore, in change management situations, it is important to be able to in some way capture new knowledge that is developing and create some way of sharing this knowledge. It is about diffusion of best practice or successes as these examples develop in various parts of the organisation. The way in which such knowledge becomes more widely codified is critical to the development of the organisation, and a change process should be able to deliver processes to enable such codification to develop.

Redundancy

Clearly, redundancy is a key enabler of the types of communication mechanisms described under knowledge codification and diffusion. Without sharing of information, it is harder for individuals to learn from each other and work out new and better ways of working together. Another enabler is the associated concept of 'requisite variety', the presence of individuals with different knowledge bases, (in the case of change, maybe individuals with knowledge of how the future could work). However, it is not possible to have redundant information without also having slack or spare resources within the organisation – or if you like, people with time to talk to others to share their information. In organisations such time is often only available for employees in special project structures. Therefore, creating redundancy in information, requires resource capacity in the organisation, something which is also often missing during times of change, and which was clearly missing at Design Co. given the time frames they were working towards. The typical approach to redundancy in change – be it resources or knowledge – is to get rid of it.

Enabling Context

As with knowledge codification and diffusion, it is the principles of the concept of enabling context that are important. In change management, there is likely to be an iterative process of discussing implications of the changes and how things should be done differently, trying it out, reflecting on learning and thinking again how to do things differently. The enabling context would be about how, through structures and informal groups, as discussed above, to facilitate sharing and development of new ways of working. This was missing in the Design Co. case. There is also a legitimacy concept here. An enabling context requires employees to use knowledge of other employees, to create useful contacts, ask for help and ideas, and to share with and learn from each other (Von Krogh *et al*., 2000). An enabling context also, therefore, has to legitimise these behaviours. Finally, the concept of a knowledge activist may have relevance, in the sense that individuals may be required as catalysts or facilitators of these conversations.

Conclusion

The above discussion shows how some of the key tenets from the field of knowledge management can encourage us to re-conceive of change management. Most organisations still reify change as something done to individuals. Individuals are passive recipients, and are told what to do. The knowledge generation perspective encourages us to view the change more as a process of innovation and creativity – not just for those responsible for leading change and developing new organisational visions and blueprints, but also for change recipients. The recipients need to be enabled to re-create their ways of working, their daily routines and practices. Whilst change can be imposed by senior managers, the detail of what individuals need to do differently to meet the aims of change cannot. Von Krogh *et al*. (2000) comment that knowledge management is an inappropriate metaphor to use when thinking about developing new knowledge – it is more about knowledge creation. The same is true of change management – we are using metaphors that are restricting the way we think about change. Whenever we think of creative activities, or innovation, we naturally expect team-based working with structures and working arrangements that encourage an exchange of ideas, intensive dialogue, and sharing and developing learning in a collective manner. Yet typically we don't apply these principles to change.

Management Implications

The main contribution that can be made by viewing change as a process of knowledge generation, is not to challenge existing notions of change, such as whether change is episodic or continuous, or to suggest we should ignore cultural and political issues, but more to change the types of interventions we deploy. Each of the different concepts we have reviewed gives us different insights into the change process. There are four main implications.

New Critical Areas of Focus

The concepts of component and architectural knowledge suggest new critical areas of focus. We should break processes of change down in to new required areas of component and architectural knowledge as we did with the Design Co. case. A key challenge is to identify the existing domains of component knowledge and also those that need to be introduced to deliver the new strategy. We then need to devise interventions to deal with each area identified. The component knowledge is potentially easier to handle than the architectural knowledge. Interventions such as new hires, training, and maybe some form of on the job training for harder to communicate areas of knowledge, can be considered.

New architectural knowledge requires a focus on new and changing interfaces – particularly interfaces where the various parties who need to co-operate do not work regularly alongside each other, such as the engineers and marketing and sales at Design Co. Across such interfaces specific interventions may be needed to encourage the process of new knowledge generation. This is where the notion of architectural knowledge links into concepts of codification and diffusion. These concepts help us to identify potential ways to develop the new required areas of knowledge. Just as we may organise training seminars and workshops to enable individuals to develop new skills, or component knowledge, we should similarly consider organising workshops to enable individuals to workout new ways of co-ordinating with each. New knowledge generation requires intensive, face-to-face interactions, supported by the use of figurative language.

Communication

We need to re-conceive the way we think of communication during change. The principles of knowledge codification and diffusion show that most types of communication utilised during change, even when face-to-face, is an inadequate way of helping people to understand what change is about and how they personally need to change. Change is not about communicating explicit knowledge, it is about the generation of new knowledge. Thus however much effort is devoted to communication seminars, videos, providing progress information, team briefs, and so on, as long as the communication remains focussed on more explicit knowledge transfer, those on the receiving end will remain dissatisfied with the communication. There are two levels of communication – first explaining the concepts of the changed organisation, the purpose of most change communication, and second enabling individuals to work out the implications for themselves and the way they work with others on a day-to-day basis. It is this second aspect that is neglected and where concepts from knowledge generation can help.

A good example is the concept of visions in change processes. We commonly see organisations 'announcing' visions to explain to people the goals of the change process, rather than using them as guidance to trigger thinking and debate about where the organisation is going and what the vision actually means. To be effective visions should be about learning (Von Krogh *et al*., 2000). It is the process of developing a shared vision, or a common understanding of the future aims that is important rather than the vision statement itself. Such ideas have resonance with the importance being placed in the change management literature on the use of 'symbolic' communication which involves the use of signs, signals, metaphor, new language and so on to get across an understanding of what the future is about. Effort is needed to create more active forms of communication, such as conversations and dialogues.

Creating an Enabling Context

The concept of redundancy encourages us to consider how to facilitate the process of knowledge generation - both in terms of how we get sharing and pooling of knowledge across individuals with different view points and opinions, and in terms of how we generate time for individuals to engage in the sharing of knowledge. We also need to consider the nature of redundancy required to enable knowledge generation. Particular architectures may facilitate shared communication, such as co-location or the creation of more socially driven activities across and within different 'knowledge domains'. It might be that the physical layout of the office needs to change in a way that encourages appropriate groups of people to meet both formally and informally.

This links into the notion of legitimising an enabling context. Ideally knowledge generation activities should be orchestrated by individuals themselves. However, such behaviour is an alien way to operate for many organisations, and it will take effort to establish such ways of working. Legitimising such activities requires in itself the development of new architectural knowledge within an organisation.

Future Research

The above implications raise many new research issues. These include how to break change processes down into areas of new component and architectural knowledge, how to create effective conversations and dialogues, how to create an enabling context for change, how to generate redundancy and where is redundancy positive and where is it negative, and the role and characteristics of boundary spanners. Perhaps most significantly this suggests a further synthesis of theories of knowledge and organisational change and also the integration of practices of knowledge and change management.

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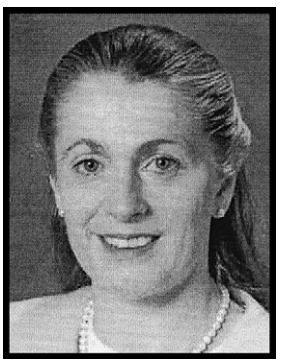

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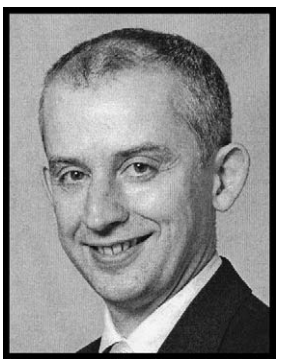

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