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**DEVELOPING AN ORGANIZATIONAL
CULTURE THAT FACILITATES
RADICAL INNOVATION IN A MATURE
SMALL TO MEDIUM SIZED COMPANY:
EMERGENT FINDINGS**

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Is the Deputy Director of the Innovation Leadership Centre. Her other major responsibilities include managing research, PhD supervision and teaching. Her current research is part of a long-term endeavour to contribute an improved understanding of the 'science-technology-economic value' chain of events. Her industrial experience has been gained primarily through positions held in manufacturing and management consultancy firms.

Developing an organizational culture that facilitates radical innovation in a mature small to medium sized company: Emergent findings

Abstract

Existing theories in the broad field of innovation management suggest that organizational culture affects the propensity of firms to be innovative, in their new product development offerings. A major thrust of inquiry implies that mature firms often lose their propensity to be innovative, as some aspects of organisational culture that were previously associated with successful incremental change, become the current cultural inhibitors of radical innovation. Whilst a large proportion of the existing empirical research has concentrated on incremental innovation or innovation management in general, there is little known about the specific aspects of organisational culture that facilitate radical innovation. Furthermore, the literature tends to focus on ‘innovation stories’ in larger firms which often simply assume that smaller firms are more agile and therefore more innovative in their approach to value creation. This paper reports the results of an exploratory case study into specific aspects of an organisational culture within a R&D setting that enable radical product innovation, in a small to medium sized UK based company in the tobacco industry. A grounded research methodology and an action research approach utilised an “issue” focus to surface the presence and intensity of cultural attributes that enable and inhibit radical product innovation. This investigation identified nine emerging themes and key constructs of a “local” innovation culture that were found to influence radicalness in new product development ventures. The interrelationships between the themes are mapped and discussed in the context of current theoretical perspectives in the field of innovation management. Finally a conceptual framework incorporating two archetypal forms of innovation culture is outlined to articulate and scope the transition between these two “ideal” states.

The Need for Radical Innovation

Innovation can be considered to exist along a continuum, from incremental innovation, in which effort is focused on trying to “do better, yet more of the same” to radical innovation in which ideas that are new to the company or new to the industry are actively being considered. Essentially this is a degree of resonance with McFadzean’s (2000) notions of paradigm preserving to paradigm breaking activities happening in this context. For incremental innovation much is known about the management of the process, the innovation process is routine and systematic and can be modelled relatively simply. For radical innovation less is known about its management, the process is ill-defined and modelling it is more complex. See Diagram 1.

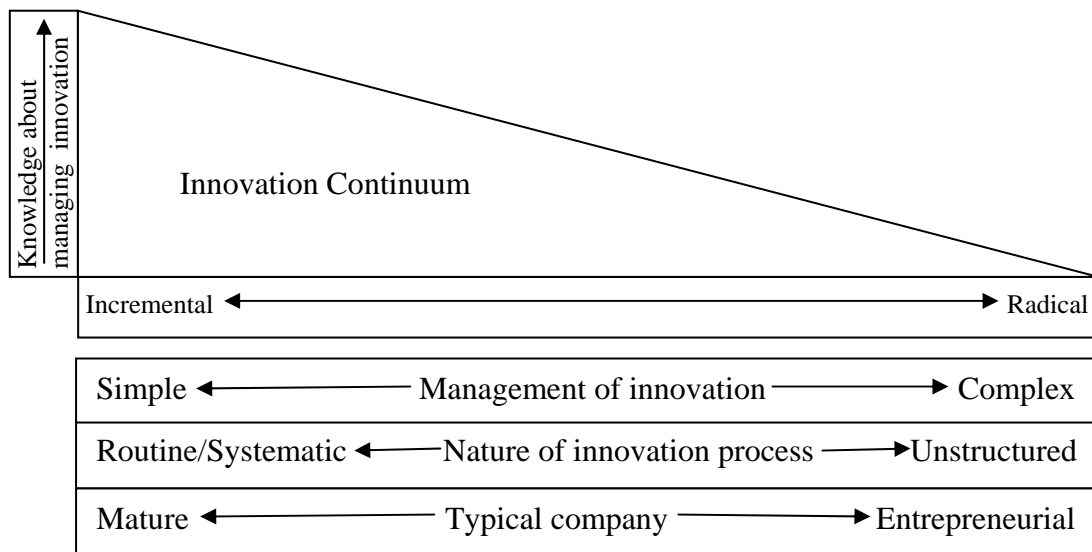


Diagram 1. The Innovation Continuum

Clearly innovation matters and it is important for success in design and manufacturing firms (DTI, 2003). Utterback (1994) states that innovation is a central determinant of longer-run success and failure for manufacturing firms. Successful companies are generally effective at responding to evolutionary changes in their markets. Where they run into trouble is in handling or initiating revolutionary changes in their markets or in dealing with disruptive technologies (Christensen and Overdorf, 2000). If a company is looking for growth levels that are significantly larger than the growth of the industry then it must take discontinuous or radical innovation seriously (Bessant, Birkinshaw and Delbridge, 2004). This perspective is supported by McDermott and Handfield (2000) who argue that in order to achieve long term growth firms need either novel replacements, new to the market products, or breakthrough products. Firms that focus only on incremental innovation are avoiding risk, but at the same time are missing opportunities. Utterback (1994) and Christensen (1997) noted how firms that dominate one generation of technology often fail to maintain leadership in the next. Radical innovation has one main benefit over incremental innovation which is that it creates products that do not replace or supplant other products, but adds something new; - ‘it takes you out of the “zero-sum” game that characterises many industry battlegrounds’ (Bessant, Birkinshaw et al, 2004: 29).

Radical innovation is associated with breakthrough ideas (Gundling, 2000; O'Connor and Rice, 2001) and with the development of new business or product lines based on new ideas or technologies or substantial cost reductions that transform the economics of a business (Leifer, McDermott, O'Connor, Peters, Rice, and Veyzer, 2000). Hill and Rothaermel (2003: 258) differentiate between the two types of innovation in that an *incremental* technological innovation builds squarely upon the established knowledge base used by incumbent firms, and it steadily improves the methods or materials used to achieve the firm's objective of profitably satisfying customer needs. In contrast, a *radical* technological innovation involves methods and materials that are novel to the incumbents.

Managing Radical Innovation

Whilst incremental innovations in new product introduction appear to be dependent on traditional management structures and processes (Ettlie, Bridges and O'Keefe, 1984), radical innovation can demand an organizational response that reaches beyond the "steady-state" approach to managing innovation (McDermott and O'Connor, 2002). Radical innovation is high-risk and high-return, and therefore does not respond well to the management practices applied to incremental innovation activities.

For radical product innovation the emphasis is on dramatic departures from existing products or their logical extensions (Veyzer, 1998). Increasingly radical innovations may utilise potentially disruptive technologies and so require a different set of rules to manage the innovation process. In such cases radical innovations involve the development of a new technological paradigm that create new knowledge and understanding, and potentially new industrial sectors. Uncertainty plagues radical innovation projects, whether this is technical, market, organizational or resource uncertainties. Consequently organisations are moving into unknown territory and experiment with new processes that largely elude systemization (O'Connor and McDermott, 2004). A radical innovation project is also marked by discontinuities, gaps, critical transitions and leverage points, often rendering traditional management modes of operation inappropriate (Leifer et al, 2000). This indicates why the business practices in some larger established firms mitigate against radical innovation, as the systems and processes that ensure continuity (the incremental improvements) become the inhibitors to innovation. (Tushman and Anderson, 1986; Ahuja and Lampert, 2001).

Context of the case study

A case study of a small to medium sized firm based in the UK was used as a basis for examining the innovation culture that facilitates radical innovation. A case study provides the opportunity to investigate a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). The firm in the case study is Cerulean, an international company that designs, manufactures, markets and supports a range of quality measurement equipment for the tobacco industry and specialized tube packing machines world-wide. Over the last ten years the company has grown to be a dominant player in its international market sectors but now finds itself unable to provide the "stream of innovative new products" that it believes is necessary to survive and grow. The company had a history of incremental innovation but had been unsuccessful in generating radical innovations from within. The perception from within the company was that the organizational culture – "the way we do things round here" was inhibiting radical innovation. Emphasis was placed on successful outcomes, risk was avoided and speculative or exploratory developments were avoided, in

order to focus on product enhancements. Recent product introductions have been “me too” products that responded to a competitor offering or an evolution of an existing product. The last example of a product that included a radical innovation was conceived about five years ago. This radical innovation came from the use of an external consultancy to create the concept that was later developed and productionized within Cerulean. In order for the company to prosper, it was believed that it had to develop the capability to develop new lines of products as well as improving existing ones. Regaining the entrepreneurial spirit of the company from ten years previously was desired, but in a manner that could co-exist along with the existing business. Recent years had seen many improvements in using modern methods and procedures and these were also essential for efficient operation of the business.

Cerulean is an operating division of Molins plc. It has a head office in Milton Keynes in the UK. Design, development and manufacturing are all carried out exclusively at the Milton Keynes head office. This facility also contains the administration functions, Sales and Customer Service for the Europe, Middle East and Africa regions. There are service, or sales and service centres in the USA, Brazil, Venezuela, South Africa, Germany, India, Malaysia, and China. There are 105 people employed by the company with around 70 of these being based at the Milton Keynes head office. The Development team within Cerulean was the subject of the research. This is a team of around 15 development engineers with length of service ranging from less than one year to over thirty years. The team comprises skills in mechanical, electrical, electronic and software engineering.

Organizing for radical innovation: the role of culture

Although there are many dimensions that influence both incremental and radical innovation, for example, national systems, knowledge flows and labour markets, it is generally agreed that organizational culture is a significant influence on the propensity of an organization towards innovation (Tidd, Bessant, and Pavitt, 2001). Whilst there is disagreement about how to best organize for radical innovation, most managers agree that radical innovation is invariably a confused, uncertain process (Humble and Jones, 1989) when compared to incremental improvement- a continuing process with a more systematic approach to change. The original driving force for innovation is technological or the personal curiosity of individuals, rather than market led (Humble and Jones, 1989) and for most operating businesses, it is “an unnatural act” because the uncertainty is too high, the time horizon too long, and the investment too large, given the risks. Organizing for discontinuous innovation, especially in the highly uncertain “fuzzy front end” of the process, is often separated from ongoing business activities (Rice, O’Connor, Peters and Morone, 1998).

Different kinds of innovation require different kinds of organizational hardware- structures, systems and rewards and different kinds of software- human resources, networks and culture. During periods of incremental change organizations can rely on units with relatively formalized roles and responsibilities, centralized procedures, functional structures, efficiency-oriented cultures, strong manufacturing and sales capabilities and relatively homogeneous, older and experienced human resources. These units are characterized by a high degree of inertia, emphasizing efficiency, teamwork and continuous improvement. During periods of discontinuous innovation, organizations require entrepreneurial “skunkworks” type of units. These units are relatively small, have loose decentralized product structures, experimental cultures, strong entrepreneurial and technical competencies and relatively young and heterogeneous employees. They build

new experience bases and knowledge systems (Tushman and O'Reilly III, 1999). Incremental innovation usually emphasizes cost or feature improvements in existing products or services largely depend on *exploitation* competencies. In contrast radical innovation concerns the development of new business or product lines, based on new ideas or technologies or substantial cost reductions that transform the economics of a business and require *exploration* competencies (Leifer et al, 2000). Diagram 2 summarizes the basic differences between incremental and radical innovation.

Incremental ←		→ Radical
<ul style="list-style-type: none"> • Formalized • Centralized • Systematic 	Procedures	<ul style="list-style-type: none"> • Contingent • Decentralized • Loosely structured
<ul style="list-style-type: none"> • Functional • Efficiency oriented 	Structure	<ul style="list-style-type: none"> • Facilitating knowledge gathering • Supporting risk taking and experimentation
<ul style="list-style-type: none"> • Homogeneous • Older and Experienced 	People	<ul style="list-style-type: none"> • Heterogeneous • Younger and Entrepreneurial • Technical • Questioning
<ul style="list-style-type: none"> • Mature • High Inertia • Focus on efficiency • Focus on team-working • Continuous Improvement 	Characteristics of the organization	<ul style="list-style-type: none"> • Entrepreneurial • Focus on discovery • Individual co-operation • Frame-breaking improvement
<ul style="list-style-type: none"> • Cost reduction • Feature addition • Efficiency improvement 	Focus	<ul style="list-style-type: none"> • New methods and technologies • Experimentation • New ideas • Creation
<ul style="list-style-type: none"> • Mostly existing 	Products / Technologies	<ul style="list-style-type: none"> • Mostly new
<ul style="list-style-type: none"> • Exploitation 	Management	<ul style="list-style-type: none"> • Exploration

Diagram 2. Characteristics of Innovation

It is suggested that some of the mechanisms that support incremental innovation can be counter-productive to radical innovation. ‘What is sound management practice for incremental innovation- where speed, cycle time, and quick cash recovery are primary objectives- might actually hamper the radical innovation's progress’ (Rice, O’Connor et al, 1998: 52). Von Stamm (2003: 260) argues that ‘radical ideas tend to need room to grow and develop, they tend to change shape and scope’ and therefore suggestion schemes, which are the foundation for incremental innovation, are not good for radical innovation. Organization cultures that facilitate radical innovation tend to be tolerant of risk taking and the uncertainty that facilitates this type of innovation (Claver, Llopis and Molina, 1998).

Veryzer (1998) refers to discontinuous or radical innovation as inherently messy, fraught with uncertainty and unfamiliarity. The process is non-linear, stochastic, highly explorative and experimental, involving probing and learning rather than targeting and developing (Rice, O’Connor et al, 1998). Management of radical innovation is suggested

to be preaching and persuading rather than managing a defined process (Tushman and O'Reilly III, 1996). The organizational culture and adherence to process found in large firms tends to push efforts towards low risk incremental innovation (Dougherty and Heller, 1994). Less is known about effective management of the development process for radical innovation than for incremental. 'It is unclear what the landscape for radical NPD looks like' (McDermott, 1999: 632), and rather than being a predictable process 'developing radical innovations involves considerable risk and requires insight and foresight' (O'Connor and Veryzer, 2001: 231).

Von Stamm (2003: 271) argues that 'incremental and radical innovation require very different business conditions, skills, structures and processes'. This is supported by McDermott and Handfield (1996: 371) who suggest that 'it is not unreasonable to expect that successful practices associated with new product development may be significantly different for discontinuous and incremental projects.' The organizational culture that supports incremental may not therefore act in the same way to facilitate radical innovation. In summary, the literature suggests that organizational culture enablers and inhibitors have an effect on the propensity of an organization to be innovative in new product development (Kanter, 1988; Ahmed, 1998; Martins and Terblanche, 2003). It indicates that mature firms often lose this propensity to be innovative, as the mechanisms that allow them to be successful become inhibitors to innovation (Leonard-Barton, 1992; Dougherty and Heller, 1994; Leifer et al, 2000; Leifer, O'Connor and Rice, 2001).

A conceptual framework to understand innovation culture

In order to develop a framework for understanding innovation culture, Schein's model of organizational culture is proposed (1984; 1991; 1992). Schein suggests that organizational culture is what a group learns over a period of time as the group solves its problems of survival. He argues that culture is a pattern of basic assumptions that have been evolved, discovered or developed by a given group as it learns to cope with its problems of external adaptation and internal integration. The model exists at three levels, artefacts, values and basic assumptions. This is shown in Diagram 3.

Artefacts are the visible organizational structures and processes. They include written and spoken language, the physical space and layout of the organization and the overt behaviour of the individuals. Schein divides these into three levels. The first is concerned with the physical artefacts like company logos. The second level is concerned with behaviour including organizational rituals. The third level is concerned with organizational anecdotes, stories and myths, and organizational heroes and villains. *Values* are the social principles, goals and standards held within the culture to have intrinsic worth. They define what the members of the organization care about. They are unwritten rules that allow members of a culture to know what is expected of them. The organizational culture reflects the values of its employees. By using these values the members are able to make decisions in order to tackle problems, issues and to develop solutions. *Underlying Assumptions* are at the most invisible level of the model. These assumptions are taken for granted beliefs and habits of perception, thought and feeling. They are rarely made explicit. When a solution to a problem works repeatedly it becomes taken for granted. These assumptions become learned responses that guide behaviour and determine how members think, act and feel. Schein's model of culture is a dynamic one. It suggests that the three different levels are continuously interacting to provide an emergent perspective of organizational culture.

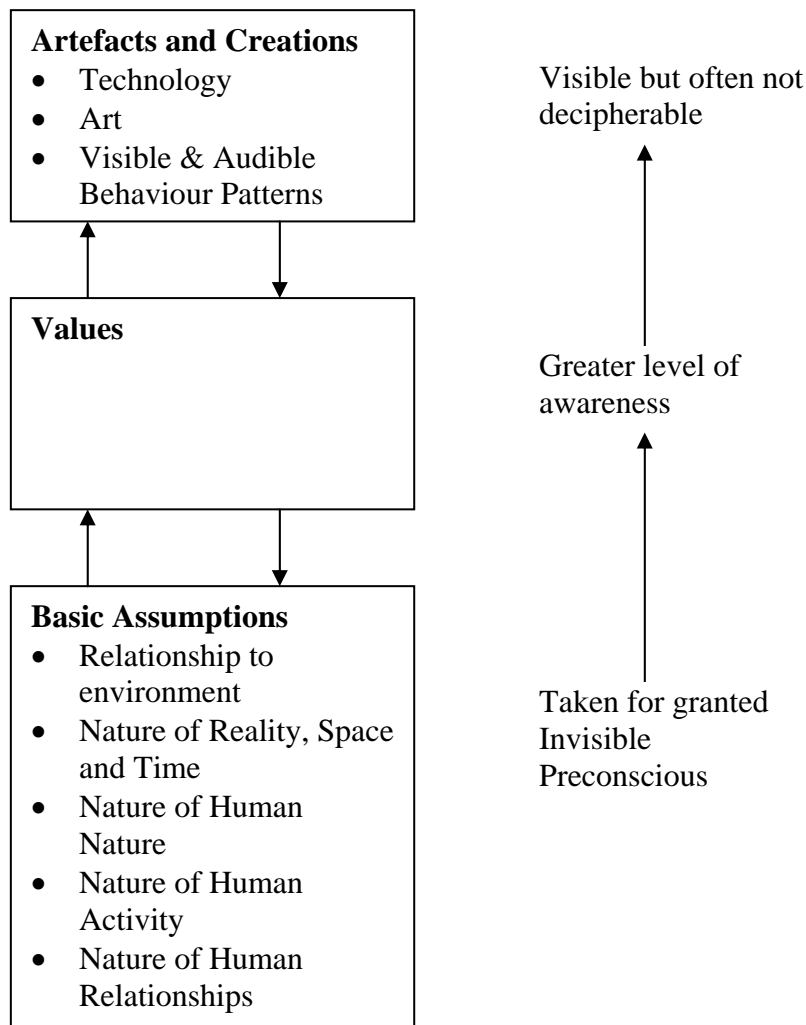


Diagram 3. Schein's model of Organizational culture

Schein's view focuses on what artefacts and values reveal about basic assumptions. The dynamic model asks, "how is culture constituted by assumptions, values, artefacts, symbols and the processes that link them?". All of the processes co-occur in a continuous production and reproduction of culture in both its stable and changing forms and conditions (Hatch, 1993). This dynamic model resonates with the perspective of innovation culture as a continuum from incremental (do better) to radical (do differently), and thus forms a basis for developing a framework to facilitate radical innovation.

The concept of archetypes (Greenwood and Hinings, 1993) is introduced to facilitate a descriptive representation of the characteristics of the two innovation "types"- radical and incremental. An archetype is defined in terms of two general statements. First, organizational structures and management systems are best understood by analysis of overall patterns rather than by analysis of narrowly drawn sets of organizational properties. This is the holistic perspective. Second, patterns are a function of the ideas, beliefs and values the components of an "interpretative scheme"- that underpin and are embodied in organizational structures and systems. An archetype is thus a set of structures and systems that reflects a single interpretative scheme. This way of defining an archetype is a departure from the more common treatment of structures and systems as disembodied

attributes of organizations, which are linked in an adaptive way to context and performance. Greenwood and Hinings suggest that structures and systems are not neutral instruments but embody, wittingly or otherwise, intentions, aspirations and purposes.

Schein's dynamic perspective of organizational culture fits well with the dynamic view of organization design posited by Greenwood and Hinings and the researcher's critical realist (Bhaskar, 1978) perspective of organisational culture as emergent. Schein suggests that culture is what a group learns over a period of time as the group solves its problems of survival. He argues that culture is a pattern of basic assumptions that have been evolved, discovered or developed by a given group as it learns to cope with its problems of external adaptation and internal integration. The model posited by Schein suggests organizational culture exists at three levels, artefacts, values and basic assumptions. Greenwood and Hinings argue that archetypes reflect the holistic approach to the study of organizational arrangements and recognize interpretive schemes as providing the basis of pattern. Schein's holistic perspective of organizational culture resonates with this interpretive scheme.

Therefore the two archetypes proposed reflect the "ideal" positions for organization culture at either end of the innovation continuum. Type I is an incremental approach to innovation. A tendency to maintain or improve in small incremental steps – a "do better" attitude. This archetype is typical of a mature company. Type II is a radical approach to innovation. There is a desire to explore, to push the boundaries – a "do different" attitude. This archetype is typical of an entrepreneurial or "start-up" company.

Transition across archetypes

Greenwood and Hinings suggest that organizations tend to operate with structures and systems that approximate archetypes and that these organizations tend to move towards archetype coherence. Passage between archetypes (organizational change) is less common than archetype stability (organizational inertia). They also argue that 'archetypes are probably institutionally specific' (1993: 1057). This indicates that transition from Type I to Type II innovation culture is likely to be facilitated by organization specific interventions, rather than a gradual diffusion. These interventions can be perceived as actions taken at the artefact and value level in Schein's model of culture. These two levels are inter-related and Schein argues that change in culture must be undertaken by attempting to change values and underlying assumptions. A value leads to a behaviour, and as that behaviour begins to solve the problem which prompted it, the value gradually is transformed into an underlying assumption about how things really are. As the assumption is increasingly taken for granted, it drops out of awareness, thus creating a shift in the organizational culture. Archetypes provide a holistic perspective of the innovation culture. Change therefore, from Type I to Type II should be conceived as a holistic process.

Research methodology

A grounded approach was adopted to surfacing the innovation culture characteristics that facilitate radical innovation. The research question was formulated as, "*What aspects of organizational culture facilitate radical product innovation?*" A grounded approach (Glaser and Strauss, 1967; Partington, 2002) to the research and participation by the Development team being studied allowed the data to be developed and refined. As the researcher is a manager in the company, this involved a participative approach (Reason and Bradbury, 2001; Coughlan and Coughlan, 2002). The plan for the research is shown in Diagram 4.

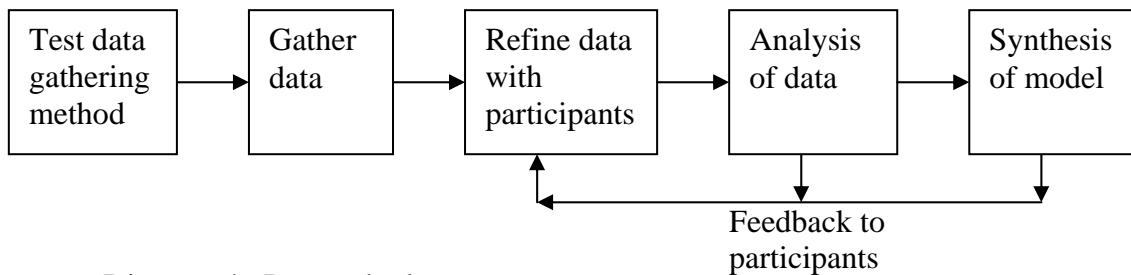


Diagram 4. Research plan

The method of identifying organizational culture characteristics was to use an issue to focus the members' attention on a specific action or event. The more visible manifestations of culture are artefacts. These may be easy to observe but difficult to decipher. Values and basic assumptions tend to remain hidden and may only reflect rationalizations or aspirations (Schein, 1992). An issue focus (Sackmann, 1991) enables the surfacing of the hidden components of culture. Given the ubiquitous nature of culture, organizational members cannot immediately reflect on their culture and describe it. A key concern in eliciting tacit aspects of culture is to provide a stimulus to respondents so that they are forced to make an interpretation that is based on their cultural framework rather than on the researcher. The stimulus should provide a specific context but leave enough latitude for interpretation. Faced with ambiguity people tend to draw on pre-existing categories already available to them for sense making. The tacit components of culture become apparent in the specific interpretations attributed by the respondents. In addition, an issue focus enables comparisons, because it introduces a specific context that forces respondents to draw on their existing knowledge. It channels the attention of the respondents to the same cultural aspects within a given organization and reveals the perceptual framework they are using to conceptualize the issue. To understand the Development team's culture it was necessary to identify shared values and basic assumptions as well as the artefacts. This was achieved by asking the team members to discuss the concrete examples of successful and less successful radical innovation.

The issue used was an example of a good and a less successful radical innovation. The definition of radical was that the innovation involved application of a significant new technology to new market opportunities. The examples chosen by the participants were of a product launched in 1999 that was perceived as only moderately unsuccessful, and the use of a vision system that was perceived as being more successful. Both these innovations fitted the criteria to be considered "radical".

Two software packages were used to facilitate data gathering and analysis. *Decision Explorer* is a package that allows the drawing of cognitive maps. It was developed to help members of a team map their view of a problem and more effectively negotiate a consensus for action. It displays constructs and linkages between constructs that represent the meaning of the construct in terms of the explanations and consequences. These links are not taken to be causal in a precise way. The link is in the form of an arrow to show the nature of the linkage. An arrow out of a construct shows a consequence and an arrow into a construct an explanation. Each arrow gives explanatory meaning to one construct and consequential meaning to another (Eden, 1988). *NVivo* is a package that facilitates analysis of qualitative data. This software permits the coding and subsequent analysis of attributes within a series of documents.

Data gathering and analysis

The objective of the data gathering interviews was to take a good and a less successful example of radical innovation project experienced by the development team and allow the team members to talk about their experiences of radical innovation. These innovation projects contained features that could be considered as radical innovation (new to the company, new to the industry) (Hill and Rothaermel, 2003) and as a clear departure from what had gone before (Delbecq and Mills, 1985; Dewar and Dutton, 1986). The interviews were semi-structured and cognitive mapping (Eden, 1988; Jenkins, 2002) techniques were used to capture the views of each participant. Each interview was recorded and transcribed. Cognitive maps (Eden, 1988; Langfield-Smith, 1992; Swan, 1997) on the organizational culture aspects influencing the radical product innovation were drawn. These were later converted to Decision Explorer and refined during follow up interviews with each interviewee. Each follow up interview was also recorded and transcribed.

The individual cognitive maps were individually validated and conflated into a single map to represent the development team's collective cognition. The single map was further validated and refined. In a parallel process each of the transcripts was analysed using NVivo and codes were produced from transcript content analysis that represented the aspects of organizational culture that influenced radical product innovation. The analysis produced fifty-eight data categories that influenced radical product innovation. A collective decision was taken to further validate and refine the coding structure through a series of four workshops. This resulted in the clustering of codes into aggregate themes (higher level codes) that represented aspects of the innovation culture that were collectively considered to be positively associated with the facilitation of radical innovation. The themes and key constructs emerged through an inductive process in which the development team members continuously refined their meaning, and hence internal validity, in a collective manner (via workshops). The description and title for the themes is also an output from the workshop sessions.

Findings: Emerging themes & key constructs

Nine themes and key constructs were identified and are briefly described below:

Company Infrastructure – Resources

This relates to the structure of the company around the development team, the resources made available to the team and the management style in which the team operate. It is termed “company” as the team members felt it related to the broader company that the team operates within. The theme is concerned with characteristics that are external to the team and which the team perceive as having no influence over.

External Confidence – Trust and Self Belief

This relates to the team's perceptions about themselves by company members who are outside the development team, in particular the top management. These characteristics cross the team boundary, originating from outside the team and acting upon the team. The data categories are more intangible than those grouped in the Company Infrastructure – Resources theme.

Focus (Clarity) on Clear Objectives

This theme relates to the concept of having a clear and well defined objective for the development project and having an unmoving target during the time the development project is active. The team felt that the data categories in this theme were external in that the specification would be provided from outside the team, with most team members

considering it top management's job to come up with the idea for a product and to provide a clear specification.

Team Constitution

This relates to the internal makeup of the team. It refers to the nature and composition of the team members and the data categories were seen as tangible and easily identified amongst the team members. They refer to the team as a whole and to the individual team members. The team characteristics related to this theme were considered to be internal to the team but the composition and manifest of team skills and experiences were perceived as being outside the control of the team, with top management the controller of these aspects.

External Perspectives, Inputs / Influences

This theme links data categories concerned with the team's interfacing with environments outside of the company. It relates to links to outside agencies and organizations that influence the radical innovation capability of the Development team. The data categories in this theme are perceived as being associated with external sources of information that are related to product needs or to available technologies.

Freedom / Latitude

This theme relates to the opportunity to take autonomous action. It groups together data categories associated with freedom to make decisions, to experiment, to define their own direction as opposed to having a pre-defined direction provided for them, and the opportunity to be self-managing and self-directing.

Attitude to Risk

This refers to the attitude within the team to taking risks. The data categories that relate to it include being adventurous, open to new and untried avenues and solutions to problems, and to being willing to make and learn from mistakes. It is influenced by the other themes but determines the behaviour of the team members when confronted with choices relating to unknown versus known and therefore safe options.

Internal Confidence, Trust – Self Belief

This theme groups together data categories associated with the team's belief in itself and confidence to resolve problems. It includes categories such as how the team members interact, how they support each other, how they perceive each other. It refers also to the confidence the team have in their own capability to produce solutions that are radical.

Department Growth and Development

This refers to the development team gaining knowledge and experience, and exploration of potential solutions. The theme groups the data categories that relate to the pushing of boundaries and desire to learn and explore. With this theme, there is an inherent requirement to cross the team boundary.

The frequency of occurrence of each theme in the interviews is shown in Table I.

Table I. Frequency of occurrence of themes in interviews

Interview	Company Infrastructure - Resources	External Confidence	Focus ~clarity~ on clear objectives	Team constitution	External perspectives	Freedom ~ Latitude	Attitude to risk	Internal confidence	Growth and Development
1	■	■	■	■	■	■	■		■
2	■		■				■	■	■
3	■	■		■	■	■	■		■
4	■		■		■				■
5	■	■	■	■	■		■		■
6	■	■	■		■	■	■	■	■
7	■	■	■	■		■		■	■
8	■	■	■	■	■	■		■	■
9	■	■	■	■	■		■	■	■
10	■	■	■				■	■	
11	■	■	■	■	■	■	■	■	■
12	■	■	■	■	■	■	■	■	■
13	■		■	■			■	■	■
14	■	■	■	■					■
15	■		■		■		■	■	■
16	■	■	■			■	■		■
17	■	■	■	■		■	■	■	■
18		■	■				■		■
19	■		■	■		■	■	■	■
20		■	■	■		■	■	■	■
21	■	■	■				■	■	■
22	■	■	■				■	■	■
23	■		■				■		■
24	■	■					■		■
25	■		■					■	
26	■	■	■		■	■	■		■

Validity

Taking the requirements suggested by Coghlan and Brannick (2001), rigour during participative action research is established by:-

Use of action research learning cycles.

Repeated refining took place following data gathering and the involvement and participation of the Development team ensured that the findings in each of the group sessions have been developed and built upon at each subsequent session. Each stage of the research process was discussed with the Development team and their input sought. The results were fed back to them and their response solicited and used to develop the next stage of the process.

How multiple data sources were assessed to provide contradictory and confirming interpretations.

The data gathered during the interviews provided one source. Observations and reflections made in the researcher’s journal provide a second perspective. Comments made by the acting Technical Director provide a third perspective. This individual was previously the Sales and Marketing Director and from mid February 2004 until November 2004 was responsible for the Development team. An interview with the acting Technical Director produced data that supported the findings from the pilot and main interviews and researcher observation.

Evidence of how the researcher challenged and tested assumptions and interpretations continuously throughout the project.

This has happened in two ways. The participation of the Development team to refine the gathered data provides one aspect of the testing process. Reflection and discussion with

Cerulean employees outside the Development team provides an additional perspective. The results of the project have also been presented at various stages during the project to academic evaluation at a doctoral colloquium and at an Innovation Leadership Centre meeting.

How the interpretations and outcomes are challenged, supported or dis-confirmed by existing literature.

An evaluation of how the outcomes are compared and contrasted with the literature is presented as part of this paper.

Evaluating the findings in theory

The nine themes developed with the team represent the areas of innovation culture that were influencing radical innovation within Cerulean. These themes can be related to the literature on innovation culture, and relationships between the themes can be drawn based on this literature.

Freedom / Latitude

Risk is related to freedom to explore (Amabile, 1988b; Ekvall, 1991). Freedom to develop is widely recognized as a prerequisite for innovation (Rickards, 1985; Amabile, 1988b; Prather, 2000; Nijhof, Krabbendam and Looise, 2002). Freedom in this context refers to deciding what to do or how to do accomplish the task, a sense of control over one's own work and ideas. The most important type of freedom is operational autonomy- freedom in the day-to-day conduct of one's work, freedom in deciding how to achieve the overall goal or mission. Organizational characteristics such as openness are supportive of innovation success (Huizenga, 2000). Prather (2000) also argues that trust and openness are important in shaping the climate for innovation. This is in resonance with Kaplan (1960) who suggests that freedom to chose problems and change direction (within restricted limits of programs and projects and goals of the organization) is one of the essential factors that positively influence creativity.

In an incremental environment the degree of freedom can be reduced and replaced with systems and procedures. These systems and procedures encourage careful improvement on that which already exists and are appropriate for successful operation of a business – the “do better” activities. The routines and systems that work well for normal business operation become inhibitors when applied to radical innovation development where experimentation and exploration are encouraged (Christensen, 1997; Sutton, 2001; Farson and Keyes, 2002). Abetti (2003) argues that over management can be as much an inhibitor to radical innovation as under management. Management of radical innovations requires balancing the natural desire of control with the realization of insufficient technical and market knowledge in order to guide and assist, rather than interfere with and control the innovators.

Attitude to Risk

‘Attempts at radical innovation produce more failures than successes, and the magnitude and timing of results are highly unpredictable. Faced with these double-barrelled negatives, it is not surprising that executives feel more comfortable in other approaches to future growth; sticking to their knitting; gaining access to innovative technologies through acquisitions; or being a “fast follower” as new concepts enter the competitive arena’ (Leifer et al, 2000: 4). Attitude to risk influences the way team members deal with uncertain situations (Schmitt, 2003). Groups that are risk averse will inhibit radical innovation (Ekvall, 1996; Harborne and Johne, 2003; Simon, McKeough, Ayers, Rinehart and Alexia, 2003). The predilection towards conforming acts and rewards for conforming-

risk aversion- is suggested by Bouwen (1991) to inherently kill innovative ideas. ‘Radical innovation will not happen without the right people. People with risk taking propensity, drive, and out-of-the-box thinking were involved in every project we followed’ (Leifer, O’Connor et al, 2001: 110). An informal, open, and inquiring environment that values experimentation, with leaders promoting innovation by creating a shared belief that team members are safe to take interpersonal risks will facilitate radical innovation (Claver, Llopis et al, 1998; Andriopoulos and Gotsi, 2002; Gudmundson, Tower and Harman, 2003; Harborne and Johne, 2003).

Growth / Development

Marquis suggests that one of the lessons from companies that are successful innovators is that the main source of innovation is from people within the company. He states that ‘training and experience of the people right in your own firm are the principal sources of information for successful innovations’ (1988: 85). Learning from mistakes is a part of the growth of the group and development of both individual and group skills and experiences (Frohman, 1998; Andriopoulos and Gotsi, 2002; Chatman and Cha, 2003). Group members should be encouraged and stretched beyond their comfort zone. A managed learning process assigns challenging projects, and assists and monitors the individual participants (Andriopoulos and Gotsi, 2002). Engaging in shared learning and development across organizational boundaries, and increasingly across regional and national ones, facilitates the growth and development of the group and individuals and facilitates “do different” as well as “do better” innovation (Bessant, 2003). Development can take the form of a knowledge brokering cycle, where the best innovators systematically use old ideas as the raw materials for one new idea after another (Hargadon and Sutton, 2000).

External confidence

Senior management must be passionate about supporting radical innovation. The support, involvement, commitment and the championing of the CEO and senior management is a critical success factor. The role of radical innovation in accomplishing the company’s long-term strategies and objectives must be clearly stated and reinforced at all levels (Simon, McKeough et al, 2003). However although top management’s support is strongly related to technical performance there is no indication that this becomes more important when the innovation is radical (Lee and Na, 1994). Pride in the team, in the company, coupled with knowing that innovation is mainstream rather than counter-cultural helps to stimulate innovation. Organizations with “cultures of pride” in the company’s achievements and in the achievements and abilities of individuals will find themselves more innovative (Kanter, 1988). Belief in the team can be a major enabler for radical innovation. An example is the development of the Polaroid Land camera. With weeks to go before the deadline, it was Dr Land’s unwavering support that drove his team beyond their limits to achieve a breakthrough innovation (Mascitelli, 2000).

Internal confidence

Creative thinking depends to some extent on the personality characteristics related to independence, self-discipline, tolerance for ambiguity, perseverance in the face of frustration, and a relative lack of concern for social approval. It is the “something extra” of creative performance (Amabile, 1997). This is supported by Hauser who argues that a culture that enables conflicts concerning discussion and prevents emotional conflicts will facilitate the early stages of innovation (1998). Employees who acknowledge and support each others’ work and do not waste time protecting their own ideas or feeling threatened by others will facilitate this type of environment (Heilmeir, 2000; Andriopoulos and Gotsi,

2002). Nemeth (1997: 72) argues that ‘dissent is a very economical mechanism for producing innovation.’ In this environment people trust that others will listen to, learn from and inform them in order to facilitate innovation (Frohman, 1998). For radical innovation, breakthroughs occur when thinking outside the box - making strategic trade-offs between conflicting priorities, attempting to reconcile the seemingly irreconcilable (Syrett and Lammiman, 2002). Having a team who are confident in themselves will facilitate taking such a perspective as there will be no tendency to adopt a “not invented here” approach (Roberts, 1988; Schroeder, Scudder and Elm, 1989).

External perspective

‘The need for external perspectives seems almost self evident’ (Wolpert, 2002: 78). Successful innovation requires the ability to harvest ideas and competencies from a wide array of sources. If a company stays locked within its own four walls it will be unable to uncover and exploit opportunities outside its existing businesses or beyond its current technical or operational capabilities. This insularity may satisfy incremental innovation but is unlikely to be of benefit for radical innovation (Wolpert, 2002). The exposure to experience and technology outside the team or the company is a necessary component for innovation (Sutton and Kelley, 1997). Huizenga (2000) found that external sources are used more than internal sources to create knowledge and that co-operation with universities is positively correlated with innovation success. Cooper and Kleinschmidt (1990) found that in a study into new product innovation in 100 companies, one of the major factors that separated winners from losers was the effective use of outside technology and external scientific communication. Willingness to communicate with external stakeholders (Hauser, 1998) and linkages with external sources (Rothwell and Dodgson, 1991; Rothwell, 1992) will facilitate innovation. Discontinuous innovations tend to originate in the environment and are initiated by individuals operating as boundary spanners and gatekeepers for the firm. It is this process of identifying, understanding and acting on external emerging patterns in the environment that is the essence of radical innovation (Reid and de Bretani, 2004). Developing radical or disruptive innovations requires the meshing of sophisticated technological and market knowledge with visions about the future (von Wartburg, Teichert and Rost, 2003).

Clear objectives

Radical innovation is invariably a confused, uncertain process (Humble and Jones, 1989). Too specific a requirement will constrain the development to “do better” innovations. A lack of clarity in the project specification is likely to facilitate radical innovation, in that it permits latitude about how to solve the problem. The team members are not constrained to clearly defined and known methods. For radical innovation, “order and clarity” (generally accepted to support incremental innovation) may be detrimental. ‘It is a well-known phenomenon that ambiguity is not threatening to highly creative people. On the contrary they become stimulated by it, they see the possibilities in an unclear situation. The effect of clear objectives on radical innovation ability is considered to be different from incremental innovation ability. General direction and strategic clarity are required for both types of innovation. Having clear objectives at tactical level is considered to be an enabler for incremental innovation only (Reid and de Bretani, 2004). Idea generation is the starting point for both radical and incremental innovation. Incremental ideas generally come from ongoing interaction between a company and its customer. For radical innovation ideas are much more likely to result from the synthesis of new and non-obvious insights from a disparate repertoire of technical information-the “fuzzy front end” (Leifer et al, 2000).

Team Constitution

Composition of an effective radical innovation team is suggested as comprising people with superior technical capability who are inquisitive, passionate, not afraid to be different, broadly educated, extremely bright, integrative, aggressive, flexible, able to take risks, goal-orientated, entrepreneurial and eager to learn the business. (Leifer et al, 2000). Innovators tend to be non-conformers and will disregard or violate existing organizational rules and norms as the need arises (Glynn, 1996). Selection of appropriate people, committed to the long term will facilitate breakthrough innovations (Wolff, 1988).

People appropriate for radical innovation are curious entrepreneurial people, solution finders not problem solvers (Leifer, O'Connor et al, 2001; Simon, McKeough et al, 2003). Team composition should be characterized by breadth of experience in addition to depth, a combination of product development skills and functional sophistication (Heine, 2001; McDermott and O'Connor, 2002). Non-conforming individuals and lateral thinkers add the ability to think of "do different" solutions to problems. Sternberg, O'Hara and Lubard (1997) argue that the type of personality required is one of determination and persistence in overcoming obstacles. They argue that creativity requires a risk-taking personality, someone who can take a stand and be a contrarian.

Team composition should be characterized by breadth of experience in addition to depth. A combination of product development skills and functional sophistication along with the lateral thinkers will facilitate radical innovation (McDermott and O'Connor, 2002). Group diversity is a major influence upon technical performance. A group that stabilizes its membership for too long not only decreases its productivity but tends to become insular (Roberts, 1988). In a similar manner, Tushman and O'Reilly III argue that team heterogeneity facilitates discontinuous innovation (1999).

Company infrastructure

Centralization and formalization should be reduced in order to facilitate radical innovation (Ekvall, 1996). The concept of an organic organization that can react to change as opposed to a mechanistic one that is bureaucratic and fixed has a long been established (Burns and Stalker, 1966; Gresov, 1984). Organizations that are structurally complex, formal and decentralized are likely to introduce new products and adopt only incremental departures from process technology when they are innovative. Incremental innovation processes that lead to new product introduction appear to be dependent on more traditional structural arrangements and market oriented strategies. An aggressive technology policy and unique structural arrangements appear to be necessary precursors to pre-innovation conditions that support radical innovation (Ettlie, Bridges et al, 1984). High innovation companies in USA, Europe and Japan have flatter organization structures, smaller operating divisions and smaller project teams (Kanter, 1988).

Resources can act as both enabler and inhibitor. The provision of too many or too few resources will inhibit radical innovation. This perspective of "not too much" and "not too little" applies to several resources required for innovation (Hohria and Gulati, 1996). Gundling (2000) refers to this middle ground of resource provision as a "Goldilocks" principle. In managing the people side of radical innovation, one of the leadership roles that facilitates innovation is that of a sponsor (Roberts, 1988; Dougherty and Heller, 1994; McDermott and O'Connor, 2002). Management of a team tasked with developing radical innovation is participative (Wolff, 1988), proactive (, Melcher and Aupperle, 1989), and encourages risk taking, conflict and questioning. These activities are perceived as unstructured and counter productive to management of routine business activities (Rice, O'Connor et al, 1998). Loosening control is necessary for radical innovation (Ekvall,

1996; Tushman and O'Reilly III, 1996). Kelly Johnson from the Lockheed Skunk Works suggested to Ben Rich that 'Control is the name of the game and if a Skunk Works really operates right, control is exactly what they don't get.' (Rich and Janos, 1994: 288).

Exploring the interrelationships between emerging themes and key constructs

The themes and links between the themes were mapped using Decision Explorer. The links are based on the literature discussed above. The links are not intended to indicate precise causality. The arrow shows the nature of the linkage. Each arrow indicates that the theme at the tail has some influence on the theme at the head. The links are based on connections suggested in the literature. The nine themes are categorized as artefacts or values based on Schein's model for this exercise. The result is shown in Diagram 5.

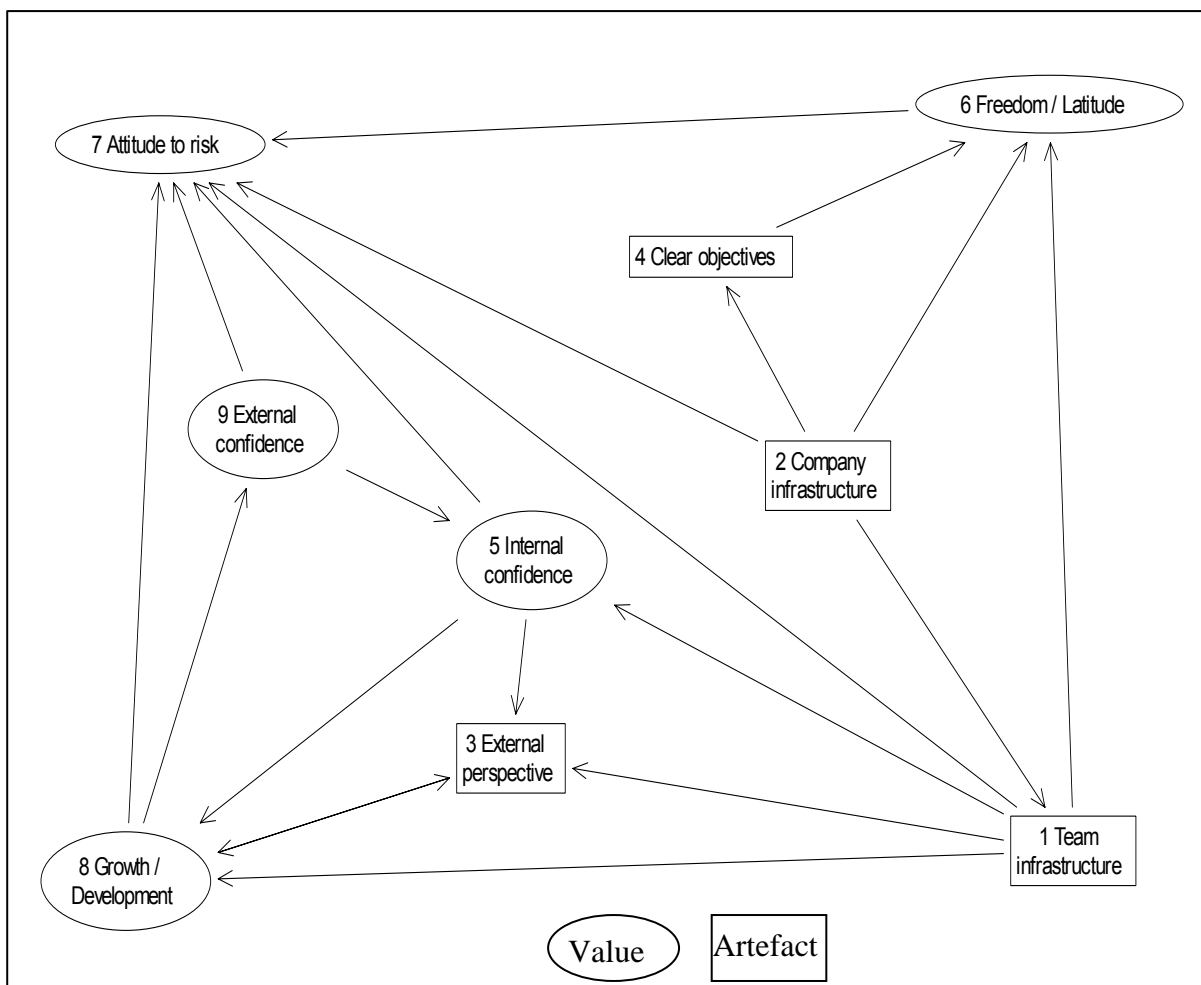


Diagram 5. Map of links between the Themes based on Schein's model

This map indicates that Attitude to Risk is at the head with inputs from other themes. Company infrastructure is the tail with links into four themes. The map shows each theme as an artefact (the visible manifestations of the culture) or as a value (that which people say is the reason for their behaviour or what they ideally would like those reasons to be). A summary of the heads and tails derived from the key literature is shown in Table II.

Table II. Links between the themes

Theme	Heads	Key literature	Tails	Key literature
Team constitution	External perspective Internal confidence Freedom / Latitude Attitude to Risk Growth / Development	(Reid and de Bretani, 2004) (Leifer et al, 2000) (Gryskiewicz, 1999) (Leifer et al, 2000) (Glynn, 1996)	Company infrastructure	(Humble and Jones, 1989)
Company infrastructure	Team constitution Clear objectives Freedom / Latitude Attitude to Risk	(Kanter, 1988) (Amabile, 1988b) (Harborne and Johne, 2003) (McDermott and Handfield Robert, 2000)		
External perspective	Growth / Development	(Terziovski, Sohal and Howell, 2002)	Team constitution Internal confidence Growth / Development	(Reid and de Bretani, 2004) (Glynn, 1996) (von Wartburg, Teichert et al, 2003)
Clear objectives	Freedom / Latitude	(von Stamm, 2003)	Company infrastructure	(Simon, McKeough et al, 2003)
Internal confidence	External perspective Attitude to Risk Growth / Development	(Syrett and Lammiman, 2002) (Syrett and Lammiman, 2002) (Sutton, 2001)	Team constitution External confidence	(Leifer et al, 2000) (Amabile, 1988b)
Freedom / Latitude	Team constitution Company infrastructure Clear objectives	(Gryskiewicz, 1999) (Harborne and Johne, 2003) (Amabile, Conti, Coon, Lazenby and Herron, 1996)	Attitude to Risk	(Amabile, 1988b; Ekvall, 1991)
Attitude to risk			Team Constitution Company infrastructure Internal confidence Freedom / Latitude Growth / Development External confidence	(Leifer, O'Connor et al, 2001) (Schmitt, 2003) (Claver, Llopis et al, 1998) (Amabile, 1988b; Ekvall, 1991) (Chatman and Cha, 2003; Frohman, 1998) (Kanter, 1988)
Growth / Development	External perspective Attitude to Risk External confidence	(Roberts, 1988) (Chatman and Cha, 2003) (Sutton, 2001)	Team constitution External perspective Internal confidence	(Glynn, 1996) (Bessant, 2003) (Sutton, 2001)
External confidence	Growth / Development	(Terziovski, Sohal et al, 2002)	Internal confidence Attitude to Risk	(Kanter, 1988) (Mascitelli, 2000)

Table III. Archetypes of radical and incremental innovation

Theme	ARCHETYPE	
	Type I Incremental “Do better” Maintain	Type II Radical “Do different” Explore
Freedom / Latitude	Unnecessary, as systems and procedures can be used to control continuous improvement. A process driven environment where incremental improvement is encouraged and rewarded.	Necessary to allow the thinking to go beyond what currently exists. Exploration and discovery are part of the way things are done.
Attitude to Risk	Risk is minimized or avoided. Following processes and procedures ensures that there is minimal exposure to uncertainty.	Taking risks is encouraged. Uncertainty is a part of the environment and discovery is accepted as being linked to taking risk.
Growth / Development	Unnecessary for the pursuit of incremental improvement activities. May hinder the procedures being followed .	A desire to grow and develop the ability and knowledge of the group. A hunger to know more and know why.
External confidence	Unnecessary for the pursuit of incremental improvement activities. The incremental improvements are generated and controlled from within the group and are unaffected by external perception of the team.	Having confidence and believing in the team supports the team’s ability to “do differently” in pursuit of radical solutions.
Internal confidence	Confidence is based in belief that following the system or working to a defined specification will lead to incremental improvements. Peer support and respect, whilst beneficial, is not essential. Following the system is more important. The team members are components of the system.	Confidence among the team members that they can find a radical solution. Working with and respecting the individual talents of each team member. Questioning, challenging but also supporting and nurturing the other team members. Team members are an autonomous unit that believes it can “do differently” to provide the radical solutions.
External perspective	Some relevance from the point of benchmarking, however this tends to provide a target for the team to match. It reinforces the “do better” mentality of the team.	Essential to provide alternative perspectives and awareness of new technologies. These may not solve the problem but may trigger a “do different” solution that leads to radical innovation.
Clear objectives	Necessary for providing a target to work towards and guidelines to operate within.	Too specific objectives may inhibit the discovery of alternatives. Objectives that are not specific and clearly defined will encourage questioning and permit knowledge advancement.
Team Constitution	Partly necessary for this group as individuals who can and are willing to follow the processes are required. Experience of technology is only necessary for application of known tools and methods. Preferable if the team members are like-minded individuals who will work well together.	The team must have a mix of creative individuals who have sufficient experience inside or outside the subject area such that they can apply lateral thinking to provide a radical solution. The team should comprise different minded individuals who can work with some degree of uncertainty and conflict as part of the day-to-day activities.
Company infrastructure	Requires a management style that encourages conformance to rules and procedures. Resources and time are necessary to complete the improvement tasks. An environment that is supportive of a “do better” or “continuous improvement” approach is beneficial.	Requires a management style that encourages risk taking. Bureaucracy or autocracy are likely to inhibit this group. Some restriction in resources is necessary for creativity – Goldilocks principle –not too little and not too much. Having a Champion to provide support at a high level is beneficial.

Archetypes of incremental and radical innovation culture

Based on the themes derived from the research, the literature discussed above and the Greenwood and Hinings concept of archetypes, a model of Type I and Type II archetypes is proposed. This describes an ideal position of the two organizational archetypes in the form of the nine emergent themes. The model is shown in Table III.

Discussion

Comfort, caution, desire for safe solution and an aversion to doing differently appear in the analysis of the data. The Cerulean Development team exhibit strong tendencies towards an incremental “do better” pattern of product development. The attitude of the Development team has been described by the acting Technical Director as the opposite of a “can do” approach. This may be a result of the risk-averse attitude within the team manifesting itself as justification for not taking action. Radical innovation is rooted in risk and a firm that embraces radical innovation must also be prepared to embrace risk. The Development team’s perspective that new product ideas should come from outside the team, in the view of the majority from the top management, indicates a perspective that encourages instruction following rather than taking a pro-active approach.

The nine themes evolved during this stage of the project can be represented as either internal or external to the group and either visible (artefacts) or as perceived (values). The group that falls into internal and perceived represent the domain of values within the group. Although it could be suggested that some of the themes outside this area are not “organizational culture”, by adopting Schein’s model as a method of visualizing the culture of the group, it is argued that the other themes represent the visible manifestations of the group culture that relates to radical innovation. The themes that have emerged from this stage of the research refer to the organizational culture that relates to radical innovation. They do not and are not intended to represent a complete picture of the organizational culture of the group. The themes are also inter-linked. The source of the links is the company infrastructure. This is the environment in which the team operates and this theme acts to influence many of the other themes but is not influenced itself by any other theme. Attitude to Risk is at the head of several other themes. This tends to indicate that the Development team’s perspective of taking risk is influenced by several other constructs, and as such is capable of being changed by addressing these other constructs. The links to the themes in the internal and perceived (values) area of the model reflect the influence that the artefacts have on values and values have on artefacts, both acting upon each other to allow the organizational culture to develop (Hatch, 1993).

The themes do not exist as stand alone entities. They co-exist as representations of the innovation enabling or inhibiting culture in the Cerulean Development team. The data gathered relates to radical innovation, rather than innovation in general. The results although applicable to the Cerulean team, do have some support in extant literature. Therefore there may be some degree of generalizability outside the area being studied.

Using archetypes as a basis for representing the innovation supporting culture allows the development of two ideal positions. Type I represents an incremental innovation supporting culture. Type II represents an innovation culture that supports radical innovation. The holistic approach that the use of archetypes facilitates allows the comparison and contrast of the two types. There is some commonality, but there are also clear differences in the culture characteristics that operate to facilitate each type of innovation. These are ideal types and it is unlikely that any organization would exhibit the characteristics of one type exclusively. However the use of the ideal facilitates the “end point” towards which any change process or activities should be

directed in order to enable the desired characteristics for radical (or incremental) innovation. Transition between archetypes is facilitated by using Schein's model. Change can be distinguished between incremental change, frame breaking change and quantum change. The dynamics of the process are different from incremental to large scale change, which involves movement from one archetype to another (Greenwood and Hinings, 1993). A series of interventions to facilitate change rather than a diffusion from one archetype to another is suggested as a method of moving towards a radical intervention culture. If these interventions are perceived as actions taken at the artefact and value level in Schein's model of culture, then transition between archetypes is possible by embedding new values and basic assumptions. As the value leads to a behaviour and as that behaviour begins to solve the problem which prompted it, the value gradually is transformed into an underlying assumption about how things really are. As the assumption is increasingly taken for granted, it drops out of awareness, thus creating a shift in the organizational culture. This shift facilitates the transition towards Type II radical innovation culture. The change necessary for the Cerulean Development team is to move the underlying beliefs and taken for granted assumptions about failure and risk taking to a position where these are believed to be opportunities for exploration and exploitation. Further study on examples of successful and less successful radical innovations in mature small to medium sized firms would provide support for the innovation culture model suggested in the paper. Such studies would also indicate appropriate interventions to transition between Type I and Type II innovation cultures.

Summary

Learned behaviour in any organisational grouping or community is an outcome of the values, ideas, techniques, habits, routines which are passed on by one generation to another – in a sense “a social heritage”, which amounts to set of solutions to problems that others may have met and solved before. This learned behaviour, or social inheritance, of any community is called “culture” (Bilton, Bonnett, Jones, Sheard, Stanworth, and Webster, 1987).

The nine themes represent aspects/attributes of Cerulean's existing organisation culture that enable and inhibit the development (or institutionalization) of a radical innovation culture. Using Greenwood and Hinings (1993) archetypes as a basis for representing the innovation supporting culture allows the development of two archetypes. Type I represents an incremental innovation supporting culture. Type II represents an innovation culture that supports radical innovation. The holistic approach that the use of archetypes facilitates allows the comparison and contrast of the two types. Whilst there is some commonality, there are also clear differences in the culture characteristics that operate to facilitate each type of innovation. The archetypes are considered to be ideal types. It is unlikely that any organization would exhibit the characteristics on one type exclusively. However the use of the ideal facilitates the “end point” towards which any change process or activities should be directed in order to enable the desired characteristics for radical innovation. The change necessary for Cerulean is for the Development team to change their underlying beliefs about risk taking to a position where risky decisions are believed to be opportunities for exploration and exploitation. Schein's model acts as a guide for managing and monitoring the transition between archetypes at various levels of analysis. Any proposed interventions to change the innovation culture could be conceptualized as artefacts or values that lead to a change in the basic assumptions (Schein, 1992). By changing the basic assumptions and values, behaviour changes can be embedded in the organization as “the way we do things around here”, thus leading to the desired radical innovation culture. In this way a social heritage for “radicalness” could be created.

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