INNOVATION IN TELECOMMUNICATION SERVICES

by

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Abstract

The dissertation investigates management processes used by organizations to improve the speed and quality of recommendations for the introduction of significant new telecommunications services. With a focus on the very early stages of concept definition, that is, at the "formulation" stage of innovation, the thesis uses an applied, prescriptive approach to communication for innovation management. It poses the following research question: *"how can multi-functional teams acquire, process, and present information in order to enhance concept formulation in telecommunications services organizations?"*

Four studies were conducted in different settings to gain familiarity with seldom seen aspects of the innovation process, to make inter-firm comparisons, and to build and refine a preliminary model illustrating connections between concept formulation and development decisions. The researcher used case studies to look at innovation processes first in depth and then more broadly in telecommunications carriage and vertical markets for telecommunications.

The thesis found that the "champions of innovation" technique can be successfully applied to achieve novel concept generation for telecommunications services. With a restricted definition of success which is focused on the output from the team, the "champions of innovation" methodology produced a diverse set of high quality recommendations in a short time relative to other techniques available to the organization. However, when the definition of success was expanded to include the ability of the team to elicit positive development decisions from its sponsors, the results were less than

successful. A disconnection can occur between a highly motivated team and under-participating managerial actors. Based on interviews with service formulators, it was speculated that this discontinuity might be avoided through the use of frequent informal communication between management and innovation teams, creating or identifying a champion within senior management ranks. Additionally, firms with clearer strategic objectives are expected to be more successful at generating, recognizing, and acting upon new business opportunities that represent a significant change in market, technology or operation. Finally, successful service innovation teams were observed to make use of novel methods that give shape to the relationships and performances that typify the intangibles of services. The thesis concludes with advice for practitioners and recommendations for further research.

Dedication

This thesis is dedicated to my parents -- Joy and Keith -- and to my family -- Deborah, Eleanor, and Maxwell.

Acknowledgements

I would like to express my gratitude to my supervisor, Paul Guild, for his guidance, support, and encouragement to me in completing the thesis. His dedication to the task and friendship to me are priceless outcomes of this dissertation. I would also like to thank Bill Leiss for his belief in my capabilities and sustained attention over many years. He is still challenging me to go further. I would like to thank Liora Salter, who got me started in this work and whose practical advice helped me complete it. Catherine Murray's close reading and provocative questions have helped me at critical stages in the development of the arguments in the thesis.

My friends and colleagues at SFU, especially Christina Chociolko and Jim MacInnes, helped me in ways and in moments that only friends can. I owe them much.

This research would not have been possible without the kind assistance of many people and organizations who volunteered to participate in case studies, be interviewed, and share documents. For reasons of confidentiality I cannot name them here but I would like to thank them all and hope that these results are at least partial repayment for that investment of time.

Finally, I would like to thank my wife, Deborah Kirby, and our children, Eleanor and Maxwell for the sacrifices they made over the past few years. They kept me alive and focused on what really matters.

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Chapter One

Introduction

> We now know that the source of wealth is something specifically human: knowledge. If we apply knowledge to tasks we already know how to do, we call it 'productivity'. If we apply knowledge to tasks that are new and different, we call it 'innovation'. Only knowledge allows us to achieve those two goals. (Drucker, 1992:26)

problem statement

How organizations create new services is an important problem for a variety of reasons. Service firms see innovation as a source of growth and a way to sustain competitive advantage. Many non-service firms recognize that their ability to compete now depends on deploying their goods with bundled services. Policy makers recognize the central role of services, especially telecommunications services, in the transition to a knowledge-based or information economy. Telecommunications services are rapidly changing at present and form the main object of the thesis research.[1] There is a relatively small literature that addresses the issue of service innovation directly.[2] The existing literature mainly addresses the issue from the perspective of identifying success factors for the innovation process as a whole. A number of studies have looked at the marketing of new services,[3] the role of services in the economy,[4] and the role of technology in services.[5] While these are important issues they are not the primary concern of this study. Rather, the concentration is on *how can teams excel in the acquisition, processing, and presentation of information that enables services formulation in the telecommunications sector of the economy.*

The question contains several explicit and implicit choices and assumptions. First, by stating the question in terms of how can teams excel, as opposed to how they function, the emphasis is on prescriptive rather than descriptive results. As academic research with a pragmatic objective, the current research seeks to speak to both scholarly and practical readers. The focus on excellence receives additional attention later in the thesis. Here the term is an objective: reducing the interval[6] and increasing the quality during the formulation of innovative new ideas. Second, the analysis is at the firm or "micro" level. Innovation occurs within the firm and increasingly, as products and services become more complex and interrelated, a sub-unit of the firm in the form of an innovation team. Third, the focus is the on the communicative aspects of innovation: the acquisition, processing and presentation of information. The role of communication in the innovation process is well documented[7] and a frequent research topic for communication scholars.[8] Fourth, the research is on an aspect of the innovation process, concept formulation, that has received some recent attention but little formal study, especially in connection with services.[9] Finally, the object of the research is telecommunications services. The rationale for this choice is that services innovation is just emerging as a field of research and telecommunications services are strategically important and changing rapidly. New telecommunications services are a source of direct competitive advantage for the firms who supply the services, a source of indirect advantage for all other firms, and by extension a key component in the growth and health of the national economy.

Previous research

One tradition in innovation research is the wide-ranging nation- or industry-wide surveys of firms (Booz Allen and Hamilton, 1968; Booz Allen and Hamilton, 1981). The Booz-Allen and Hamilton (BAH) studies are widely cited and the results have had broad penetration in the manufacturing industry over the past two decades (Page, 1993). The defining features of a successful innovator, according to these studies, are organizing for innovation in multifunctional or multidisciplinary teams (Crawford, 1987; Thamhain, 1990), encouraging or allowing product 'champions' (Peters & Waterman, 1982), the use of an innovation strategy (Booz Allen and Hamilton, 1981), and the use of a 'staged' innovation process (Cooper & Kleinschmidt, 1986).[10]

Martin and Horne surveyed 217 service firms in the U.S. and found that service firms' use of the techniques suggested by Booz-Allen, Cooper, Crawford or Kuczmarski (Kuczmarski, 1992) was much lower than in manufacturing firms. This work suggests that the advice is either not spreading to service firms or is inappropriate to their needs. Martin and Horne also found no significant relationship between success and the use of the recommended processes (Martin Jr. & Horne, 1993). Martin and Horne used a survey technique and sample that included virtually all sub-sectors in the services sector in order to "break away from the single industry focus" (p.50). The lack of significant findings in their results suggests that perhaps the wrong questions were being asked. Therefore, there is room for more in-depth analysis of what makes innovation work for services.

A different tradition in innovation research, the case study, seems a more profitable approach at this time, given the "embryonic" status of

research on new service development. Given the lack of widely recognized theories about new services, it seems reasonable to use case research to engage in what Glaser and Strauss refer to as grounded theory building through repetitive analysis of data (Glaser & Strauss, 1967; Strauss & Corbin, 1990). This research is in the style of Eisenhardt's work on building theory from cases (Eisenhardt, 1989) but with an emphasis on telecommunications services.

Definition 1: Innovation

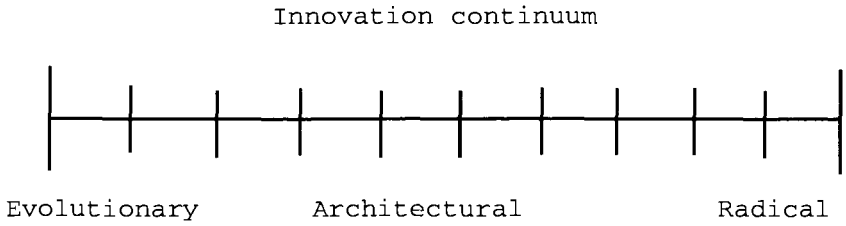
It is important to distinguish between invention and innovation. An invention is a new idea that lacks a market. Innovation is the application of ideas to markets.[11] Innovation is also a process. While innovation could be regarded as an outcome ("telephone banking is an important innovation"), this tends to guide thinking on change as a static event or something to be considered retrospectively. On the other hand, if we consider innovation as a process ("how can we develop new services for home financial transactions?") the possibility of managing change becomes more apparent.[12]

If innovation is a process, time becomes significant. We can break innovation time into stages. There are early stages, when concepts are formulated and decisions are made; middle stages, when prototypes and then final versions are developed and refined; and later stages, when products are deployed and later withdrawn from the market. Applied innovation research has, until recently, tended to focus on tools that enhance the speed and improve the quality of the last two stages -- development (e.g., concurrent engineering, CAD software) and deployment (e.g., "just-in-time" delivery of goods, CAM software). An emerging body

of literature, drawing on perceived financial and strategic benefits, advocates earlier attention to the innovation process (Smith & Reinertsen, 1991). Financial benefits accrue from early attention to costs.[13] Strategic benefits may derive from the advantages which "first movers" are able to exploit in terms of credibility and reputation with customers, connections with suppliers, experience with the production process,[14] and opportunities to set standards.[15] The present study looks exclusively at the earliest stages of innovation, a period variously referred to as the "front end" (Johne, 1984), the "fuzzy front end" (Smith & Reinertsen, 1991), and "formulation" (Timmons, 1990). The term formulation will be used here, defined as "activities performed to recognize, shape and evaluate the information necessary for defining opportunities for new products which are both desirable to, and attainable by, the business unit.[16]"

Significant innovations, rather than radical or incremental changes, are the focus of this dissertation. Significant change is defined for the purposes of this research as a change which involves more than minor change to either the market/customers, the technology, or the production/delivery process. It stands between on the one hand radical changes, defined as a paradigm shift or whole new technological system, and on the other incremental changes, defined as changes which are improvements processes or decreases in costs.

Figure 1.1: Types of change



Henderson and Clark use the term "architectural innovation" to describe a similar 'between minor and major' typology of innovation (Henderson & Clark, 1990). For their analysis the definition of architectural innovation was important as they were using it to describe how firms could effectively compete without revolutionizing their industry by re-configuration existing components in a system -- changing the architecture of a product. For the present purposes it is sufficient to define some middle ground on an innovation continuum such that we can see what significant innovation is not. It is not, as incremental innovation is, sufficiently served by existing market research techniques for concept development. And it is not, as revolutionary innovation is, too complicated or uncertain to benefit from some systematic management aimed at interval reduction.

Approach

Attention to the earliest stages of the innovation process, while a laudable objective, quickly encounters practical problems: what sort of attention? Who should do it? How should they be equipped? Where should they look for inspiration and how should they report their findings? Some of the answers to these questions have begun to emerge. One of the most promising approaches to concept formulation is to approach leading

edge users in a technology or market trend to determine what kind of modifications or 'home grown' innovations they have already implemented. The attention to users follows from findings in the 1980s by Eric von Hippel that overturned conventional wisdom about innovation. Traditionally it has been thought that the people who make products are the ones who develop the innovations. As it turns out, the sources of innovation vary greatly. According to von Hippel,

> In some fields, innovation users develop most innovations. In others, suppliers of innovation-related components and materials are the typical sources of innovation. In still other fields, conventional wisdom holds, and product manufacturers are indeed the typical innovators. (von Hippel, 1988:3)

The reason for this variation, von Hippel found, is economics. Innovating firms, be they users, suppliers or manufacturers, were the ones who could reasonably expect profit from the innovation. Depending on the configuration of a particular industry, therefore, it may make more sense to look outside, to lead users and suppliers, than internally during the formulation stage.

For those industries in which innovation is dominated by users, Eric von Hippel and Glen Urban developed and refined a technique for capturing innovative ideas from users and use them in the concept formulation process for new products (Urban & von Hippel, 1988). They called this technique the "lead user method."[17]

The technique was adapted and extended by Antonio Bailetti and Paul Guild (B&G) to encompass leading edge suppliers as well. This technique, called "champions of innovation", also addresses several other weaknesses of previous methods of formulating new products. One of the ways that firms have traditionally 'looked outside' is through marketing research. This type of research typically asks customers what they would

like to see in a new product. There is considerable evidence to suggest, however, that people are overly influenced by what they have when considering what they want.[18] Novel and viable solutions are relatively rare in this sort of environment. In the environment in which B&G were working, marketing visions were translated into specifications by product designers. Citing Burgelman and Sayles (Burgelman & Sayles, 1986) and Rubenstein (Rubenstein, 1989), B&G note that "lack of designers' acceptance of the operational definition of an innovative new product frequently results in longer intervals, organizational friction, and higher R&D costs" (Bailetti & Guild, 1991a). To address this difficulty, B&G turned to a lead user type of technique but modified it to involve designers directly, instead of relying on outside experts to identify trends and interpret lead user suggestions. "Designers," B&G assert, "broaden the range of receptors to the environment and their participation provides a more robust basis for recognizing the value of new, external information (1991)." An additional benefit is the increased depth of knowledge designers acquire through participation in the innovation process. In addition, designers were provided with opportunities for face-to-face interaction with leading users and suppliers. As noted above, this form of communication is particularly important when the topic is complex and rapidly changing, as telecommunications products tend to be.

Context

The focus of attention for the present research is telecommunications services. In the context of a lead user probe, the first question is how is this industry configured *vis a vis* sources of innovation? A study by

Capell suggests that the necessary preconditions for a lead user probe[19] are present in telecommunications services.[20] The presence of important trends, lead users and suppliers, mutual benefit and an effective method of contacting champions was confirmed in this research.

Innovation research extends beyond the concerns of the communication scholar. Economists and management scientists in particular are very interested in both the process and the outcome of innovation activities. In recognition of the considerable overlap with these disciplines, this dissertation will highlight those aspects of the inquiry and the findings as they connect with the theories of economic growth and innovation as well as the role of innovation in technology strategy. The thesis begins with an overview of the connection between globalization, competition and innovation in the next chapter.

Related research

Most of the previous research on innovation is not from a communication perspective but from economics, marketing and management of technology. Each of these fields has insights that support or enhance the present inquiry.

Economics

Economics helps establish the context for service and service innovation by describing the importance of services. Economic historians have documented the treatment of services in economic literature (Delaunay & Gadrey, 1992). The most notable example of this work is the debate on whether services are 'productive' or unproductive. Current thinking is that services are 'productive' in the sense that they contribute to growth.[21] This is significant since as long as services

were thought to be unproductive activities, the study of services innovation was deemed to be of marginal importance.

Economics also helps us understand the current magnitude and reasons for growth in services. Services have experienced dramatic growth over the past half century. Measured either in terms of employment or as a percentage of gross domestic product (GDP), services are the dominant activity in all developed western economies. The United States, with approximately 70 per cent of employment in services, is merely the most advanced example of a path that all developed countries appear to be following. For quite some time services growth was linked with affluence, according to "Engel's Law", named after a 19th century German actuary by the name of Christian Engel. Engel postulated that growing levels of income result in (proportionally) growing levels of demand for services: Households with relatively high incomes spend proportionally less on primary products (food, housing); the same phenomenon of saturation arises eventually with secondary products (appliances, furniture) (Engel, 1857). More recently Gershuny discounted the importance of Engel's law, citing the counter-influence of the 'self-service economy' where to an increasing extent tangible goods replace services[22] (Gershuny, 1978). The growth in services continues however, due at least in part to the dramatic rise in so-called 'producer services' (i.e. the services provided to the producers of tangible goods) (Grubel & Walker, 1989; Wood, 1988). In addition, more and more products contain a significant service element with or associated with them, as in the extended warranties and roadside service included with the purchase of an automobile these days.

Most recently we have seen the acknowledgment from economists that productivity growth in services is an essential component in the quest for wealth and economic growth. As argued by economist Paul Krugman, a percentage gain in service productivity is three to five times as important to a national economy as a similar gain in productivity in manufacturing (Krugman, 1994). The key to productivity, economists as well as managers agree, is innovation.

A third important thread in the economic literature on services is that which is found in the work by Daniel Bell and others on the information economy (Bell, 1973; Giarini, 1992). These authors argue that the changes to economic life which we see in the jobs and output figures for services are an indicator of a far more significant change: the transition from an economy based on things (the industrial economy) to an economy based on ideas (the information economy). This will have a profound impact on social relations, these authors argue. Services are the prototypical information economy industry and therefore merit attention as they represent not only the economic future but also the social future of humankind. From the perspective of the service innovator, these changed social relationships and roles provide a unique opportunity to understand customer needs and wants. The "prosumers" (consumers who produce their own products, as in the home entertainment created on "camcorders") (Gershuny, 1982; Giarini, 1992) are a ripe source for innovative ideas (Udwadia & Kumar, 1991) and in circumstances where they exist excellent innovators will develop means to tap into their insight.

Marketing

The marketing literature contributes to the present study in three important ways. First, marketing researchers have developed some taxonomies of services, allowing them to be defined and categorized. Second, marketing scholars and practitioners have laid the groundwork for a discipline of service marketing and service management that is distinct from the marketing and management of goods. Third, the marketing literature from the early 1980s provided the first examples of researchers who attempted to define the parameters and concerns for new product development for services.

Services have long been defined as that which isn't manufacturing or resource extraction. The classical term for services, the "tertiary" sector, is used to describe everything that is left over after taking into account the primary (agriculture, resources) and secondary (manufacturing) sectors. While this definition has merit for being simple it is of limited use in the management of complex modern services.[23] Marketing scholars such as (Lovelock, 1983) have tried to shed light on the matter by formulating classifications of services so as to allow industry- or type-specific responses to problems. In this research, much depends on the ability of an innovation team to determine the sources of innovation in their unique industry.

Before scholars could get to that point, however, the debate on the difference between products and services needed to be resolved. A certain amount of unhelpful generalization ("all products are services" and "services are just intangible goods") failed to address the problems of the service practitioner. Recently, however, scholars such as Bateson (Bateson, 1979) have presented convincing evidence in support of a

distinction between goods and services as well as some indications for the basis of that distinction and the implications that follow from it. The most common distinction is the relative intangibility of services. According to Bateson,

> Services marketing should be developed so that managers can use techniques that are sufficiently abstract to be applicable across industries but close enough to the particular service market to be useful to line management. Most problems and differences between the management process of goods and that of services stem from one structural difference -- intangibility of service offerings. "Services are doubly intangible: they are impalpable -- they cannot be touched by the consumer, and they are difficult to grasp mentally." Since services have a "fuzzy" image, consumers and marketers have no common point for discussing a service. (Bateson, 1979)

Additional distinctions between goods and services include the fact that they are often produced and consumed at the same time ("simultaneity"). Depending on the extent to which they are equipment based or people based (Thomas, 1978) there is more or less standardization possible ("heterogeneity"). *The Economist* has more simply defined services as "anything sold in trade that could not be dropped on your foot[24]"

These distinctions have direct implications for the new service innovator. For example, the level of intangibility of services has led to the observation that people have a greater difficulty determining the risk of trying a new service (George, Weinburger, & Kelly, 1985; Guseman, 1981). Simultaneity is also a contributing factor to the level of risk in services. As the economist Giarini observed, "whenever real time is taken into consideration, the degree of uncertainty and of probability which conditions any human action becomes a central issue. Thus the notion of risk and management of vulnerability and uncertainty become key connotations of the service economy" (Giarini, 1992).

Shostack has pointed out the impact of simultaneity has on the creation of models or 'mock-ups' of new services. Since they are produced and consumed simultaneously it is often necessary to construct an entire production system and bring the customer to that site in order for them to experience the new service (Shostack, 1981; Shostack, 1984). Simultaneity has an additional impact in the formulation of new services. If consumers are to be involved in the 'production' of a service,[25] i.e., the production process is potentially highly visible, then the 'operations' side of the organization will have a considerable influence on the direction of new services (Easingwood, 1986).

Because intangibility makes evaluation of new services difficult on 'concrete' grounds, the argument has been made that consumers are more likely to make their choices on a 'non-evaluative' basis, such as 'name' or 'reputation' (Easingwood, 1986; Zeithaml, 1981). As a result, service companies may be persuaded to introduce new services in order to maintain their customers' perception that they are a 'full service' organization.

Management of technology

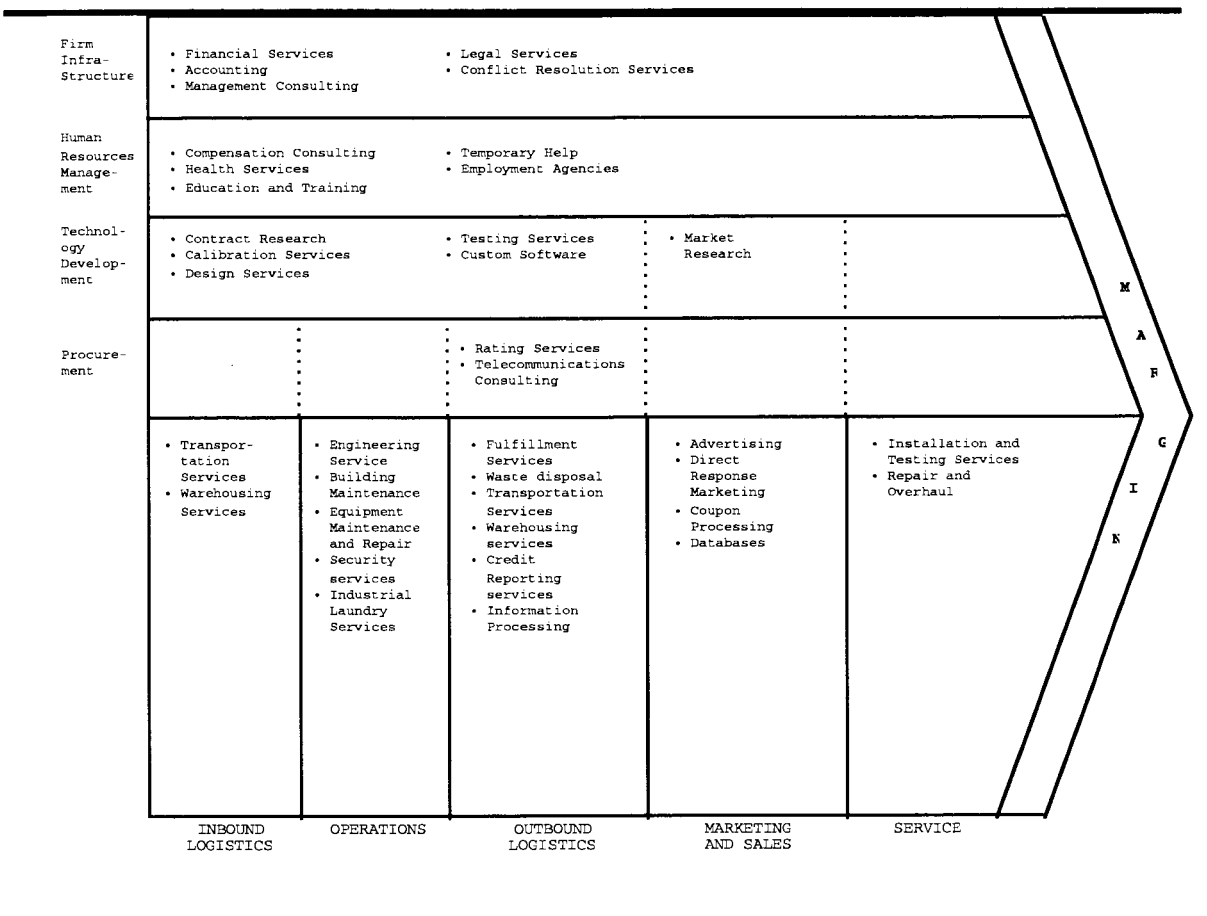
The third body of literature that has informed this research is the emerging management of technology literature. Management of technology (MOT) is a relatively new field of research and practice. In her 1989 book with David Wolfe, Liora Salter identified four paradigmatic "roots" in the literature: theoretical, business, labour process and social science (Salter & Wolfe, 1990). The business paradigm has been used in this thesis because, as was pointed out recently, "many of the constraints to technological innovation lie at the level of the firm and … good management practices can overcome these constraints. It is

increasingly recognized that simply investing in R&D and new manufacturing equipment is no guarantee of success. Effective innovation requires considerable managerial input at both the strategic and tactical levels" (Science Policy Research Unit, 1991).

The majority of the MOT literature does not address the services industry except indirectly as business issues. Among those writers that have considered services, three themes are important for this research. The first is the recognition and description of the importance of technology for services. The second is the difference between service innovation and manufacturing innovation. The third is the role of services in forming and delivering organizations' strategic objectives.

Much of the debate in this literature uses the concept of a "value chain" to explain the role and importance of services. The model of a value chain was introduced by Harvard economist Michael Porter in his 1985 book *Competitive Advantage* (Porter, 1985). Porter used his value chain -- the steps or linkages that a firm or industry takes between primary resource and customer value -- as part of his analysis of competitive strategies for firms. A value chain consists of a one-directional flow of goods through three generic activities: inbound logistics, transformation, and outbound logistics. A version of this model as applied to services is reproduced in Figure 1.2. The concept has received wide-spread acceptance and is used in many contexts today.[26] For our purposes, the value chain represents a frequently used model in strategic management and the management of innovation. A firm that understands their own and their customers' value chain is better positioned to create new goods and services.

Figure 1.2: A Value Chain for Services



In a two volume collection of research edited by Bruce Guile and James Brian Quinn, various authors introduce evidence to contradict the four "myths" about services industries -- that they are low-value-added, small-scale, not capital intensive, and technologically unsophisticated—compared to manufacturing industries (Guile & Quinn, 1988a; Guile & Quinn, 1988b). Case studies and national economic data are used to show comparable if not higher levels of value added, scale, capital intensity, and technological sophistication in services. The notion that services represent a higher value added is particularly important, since it suggests manufacturing firms need to pay closer attention to the

service component of their output. Quinn has argued in this and other articles and books that the most effective strategy for a firm to take is a service strategy. Technology and innovation should be organized with the end in mind, which is the delivery of services.

Morone, Berg and Pitt took some of this economic data on services and considered the implications for firms who work on technological innovations for services. They confirmed Quinn's point about the level of technology in services but also suggest that, at least on a first order basis, the principles of technology management for manufacturing were broadly applicable to services as well (Morone, et al., 1990).

Graham Mitchell provided an overview of the changes in the innovation process at GTE Laboratories as services gradually came to dominate the product line (Mitchell, 1990). Mitchell's conclusion is that there are differences in technology management between manufactured goods and services and that these are mainly evident in shifts in the kinds of skills required among R&D personnel. As an example, he points out that in traditional research laboratories physical sciences and engineering disciplines tended to dominate, while service applications require "close coupling to the customers' wishes and needs" (1990:960). In his experience, "as technical skills and resources are applied toward the end of the value chain, i.e., to the service sector, generic needs such as the design and building of the physical system or network, operation of the system, and the services "products-of-the-system" inevitably form the focus of the R&D program" (1990:960-61). This may mean, for example, that the typical innovation team will have to include more 'front line' or customer contact personnel.[27]

Methodology

Background

Several points of view are present in previous service innovation literature. One perspective is represented by those studies which have focused on 'success factors'. These are often survey based, looking at firms in one service sector such as finance (de Brentani, 1989), several representative sectors such as tourism, building societies, and telecommunications (Easingwood, 1986), or all service types (Martin Jr. & Horne, 1993). The objective in these studies is to enumerate service firms' usage of innovation processes -- either those that have been linked to success in manufactured goods industries by the Booz-Allen studies in the 1960s and 1980s (e.g., stages, plans and strategies, "champions") or processes that are unique to services -- and link these to new product "success".

One unfortunate aspect of these studies is a tendency to enumerate the entire development process without an attempt to differentiate or focus on concept formulation/development. Each stage in the development process presents a set of distinct information and decision requirements and lumping them all together tends to blur these distinctions.

Distinctions between innovations in this literature also tend to focus on the level of success[28] and not on the character of the innovation. While "success" is the ultimate goal of an any innovation process, two problems arise when considering this as a variable to study. First, the definition of "success" is extremely variable -- one firm may innovate to stay ahead of competitors, another to catch up. One firm may innovate to reduce costs, another to increase performance, yet a third to enable higher profits from the perception of better products.

A second perspective is found in those studies which provide the reader with a model of the service innovation process. Some of these models are created by practitioners are heavily oriented to the 'how-to' of creating new services,[29] and are generally industry-specific (e.g., see Shostack on financial services (Shostack, 1981; Shostack, 1984) or Bowers on health services (Bowers, 1989)). Others are more theoretical and attempt to establish formal or broadly applicable models (Barras, 1986).

A third type of study on service innovation is the case study. To date these have been limited to relatively short descriptive accounts of the innovation process for a particular new service.[30] One exception is the set of comprehensive case studies in the collection edited by Guile and Quinn, although these are not oriented to formulation specifically (Guile & Quinn, 1988a).

Several observations can be made about all three of these research perspectives. With the exception of a few of the case studies, almost all research on service innovation takes the form of *post-facto* accounts. Innovation is frequently a secretive and competitive process, especially when it is related to pre-development projects. As a result, few of the studies have provided a day to day view. Moreover, very little research presents an 'insider' perspective on the day to day operations of an innovation team. Academics and not team members are the ones who write up case studies and surveys. Being *post-facto,* innovation research omits those projects that no-one remembers, the ones which never reached the development stage. Smith and Reinertsen point out that some projects fail at this point not because the idea is not a good one or the market or technology does not exist but because the window of

opportunity has passed -- the formulation was not fast enough or of sufficient quality to call forth a development decision. While it is widely recognized that innovation comes in many forms, depending on the significance of the change, this variable has not appeared in the service innovation literature to date. Finally, there are few if any studies which look at the process details of the innovation process. The work to date has been largely results oriented or concerned with process and has focused on the many stages involved. Researchers have not yet taken the time to reduce stages to process and comment on the effectiveness of the available tools.[31]

Research method

The present research draws upon these three perspectives but forges a unique point of view suited to the problem statement (*"how can teams excel in the acquisition, processing, and presentation of information that enables services formulation in the telecommunications sector of the economy"*). In order to provide depth to the analysis of teams working on innovation, the research begins with an in-depth examination of one innovation at one firm. When the research moves beyond that firm in order to develop a greater breadth of insight, the focus is on exceptional rather than random firms. In the study of change there are usually few examples of those at the cutting edge of change. It is therefore important to seek them out rather than waiting to see if one turns up in a sample. In order to look at the communicative acts that constrain and enable the creation of new product concepts, the present research focuses exclusively on the pre-development stage known as formulation or the fuzzy front end rather than a review of the entire innovation process from ideas to marketing. In order to restrict the

research to an aspect of innovation that makes sense to manage closely in the formulation stages, the focus is on innovations which involves a significant change to markets, technology, or operations.

The theoretical approach is also be addressed but on a much smaller scale. It is apparent that services innovation research takes place in a relative vacuum in terms of models for action and behavior. Therefore, this research contains some preliminary attempts to model the innovation process for services.

The research begins with an extended case study (using participatory action research techniques). This allows an insiders view of the very earliest stages of the innovation process, including concepts which did not go forward to development. The participatory research provides at least a partial answer to the first word of the research question '**how** do teams..."

This research focuses on the details of innovation techniques. Even though there is little in the way of formal models for the formulation process at this juncture, there is a need to get on with the job of identifying new business concepts more quickly and with greater quality. The measure of success in this is not so much whether the team has done a perfect job or even the right job but whether their tools and techniques have enabled them to do it better than before. In this way problems can be identified and solutions developed -- the "applied" aspect of applied science. In the mean time, careful attention to the process by observers with a scientific method can contribute to model building and theory development -- the "science" in applied science.

This research uses a targeted sample of exceptional firms. The focus on exceptional firms is consistent with the focus on exceptional

innovators within the 'champions' technique. The logic of learning from extreme cases, which underlies the champions method, is here applied to the study of the innovation process itself. Without such an effort, studies tend to turn up relatively few truly innovative organizations.

The idea of beginning the research with a participatory study has several merits. First, it is appropriate in a program of applied science that the candidate spend some time working with real problems in a real world context. The experience with an innovation team provided that experience. The researcher's presence provided an opportunity for the candidate to at least partially repay the support of sponsors and participants in the research. More importantly, the participatory action research provided an unparalleled opportunity to participate in a seldom seen aspect of the innovation process -- pre-development concept development.

Formalized or systematic pre-development activities are very rare in business generally and almost unheard of in services. In Page's recent study of innovation practices in the U.S. and Canada, fewer than 15 per cent of firms used any sort of formal process at this stage in product development (Page, 1993). If a formal process does not exist, it is unlikely that a researcher could identify pre-development innovation activities in a survey or interview. Similarly, a respondent would be hard-pressed to identify which of the company's activities were "concept formulation".

Passive observation could have enabled the researcher to gain access into the venue where such activities might occur but, given the results of Page's survey, their low incidence might have resulted in a great deal of elapsed time before the topic came up.[32]

Instead of being passive, the researcher could take a more active role and introduce the topic to a firm. This is only a partial solution, however. It does raise the research question in the appropriate milieu and this would be useful for determining how things are done at present. That may be unhelpful, since recent research (e.g., Page 1993 and Martin & Horne 1993) indicates that very little is done in the way of systematic techniques to enhance service innovation. Merely raising the topic will not be enough. Therefore, although it is necessary to introduce the topic it is not sufficient in this case.

In these circumstances it is necessary to go further, to introduce a change or identify circumstances where a change is being introduced. A related problem faces the scientist hoping to understand the impact of minute quantities of a substance. If you wait for the rats to die of cancer at normal background dosages you may find that hundreds of people die while you try to find the answer. The response in this sort of situation has been to introduce a change: high dosages of the substance in question. In social science, similar experiments are not generally feasible. It is sometimes possible, however, to select a situation where a change has been introduced and study that in depth.

The solution in this case was to identify a formulation technique that was thought to be well-suited to the telecommunications services environment and implement it with a team. In this way the researcher has a 'ring side seat' to the innovation process. There are two benefits from this approach. The practical benefits derive from a team that has been given new skills and a technique that has been tested and improved in a real world setting. The academic benefits derive from 1) a better understanding of the technique and how and why it works (or does not

work), and 2) an understanding of the innovation process within the organization since it has been disturbed by the technique and therefore its workings are made explicit.[33]

A further benefit, applicable at both the academic and practical levels comes from participatory action research. To the extent that the contributions of the researcher are useful and appreciated, the researcher will gain a level of credibility that might have been otherwise unavailable.[34] High performance teams do not suffer non-performing members easily (Katzenbach & Smith, 1993b; Thamhain, 1990). The researcher's contribution must be substantial, otherwise they may not be accepted as a team member.[35]

Study design

In order to acquire both depth and breadth of understanding, four studies were conducted. With little previous research to guide the selection of theories and hypothesis testing, the researcher chose to proceed with an incremental research strategy. Also known as grounded theory, the objective is to build theory gradually through sequential investigations and continuously challenging the data. The first study was designed to deliver the greatest depth by virtue of the length of time in the field (two years total, six months full time) and mode of contact (active participation). Studies two to four added breadth in the form of additional companies studied in a greater diversity of circumstances and using similar (study two) and dissimilar innovation techniques (studies three and four). The first two studies were based on case studies of the "champions of innovation" technique pioneered by Bailetti and Guild and inspired by the lead user work of von Hippel. Studies three and four added additional cases where the champions

technique had not been used explicitly. In some cases equivalent methods had been followed, in others the techniques were unique to the organization.

In those situations where a lead user/champions technique was under investigation, three sets of actors were present: teams, "champions", and change agents. The participants in the study, the actors under consideration, were teams.[36] The teams all had an objective, the formulation of new telecommunication service concepts. The teams achieved this objective by identifying, contacting, and understanding the actions of others, the "champion" users, customers, and suppliers. The change agents were responsible for initiating the team's activities and acting on their recommendations.[37]

The literature on teams and teamwork is large and growing. Several important books and articles on the subject have been published in the last year (Henke, Krachenberg, & Lyons, 1993; Katzenbach & Smith, 1993b) and numerous other works describe the importance of teams for concepts such as concurrent engineering (Reddy, Srinivas, Jagannathan, & Karinthi, 1993), total quality management (Oakley, 1993), business process re-engineering (Hammer & Champy, 1993), the learning organization (Garvin, 1993), and new product development (Bailetti & Guild, 1992; Donnellon, 1993).

A common thread in this literature is the importance of multidisciplinary teams. For the innovation process multidisciplinarity is important for several reasons. If a team includes representatives from several departments/functions in the formulation of a new product, this is expected to assist in generating the necessary interest at a senior management level to trigger an "action threshold" for development

decisions (Bailetti & Guild, 1991b). A team with a varied set of skills and backgrounds is also thought to have a greater "absorptive capacity" (Cohen & Levinthal, 1990), a necessary ingredient for the effective utilization of new knowledge. Interdisciplinary teams are also thought to be more capable of dealing with the complexities of new product development in the current era (Donnellon, 1993). Teams are also reported to be faster to develop new products because they are able to accomplish several tasks at once (Thamhain, 1990). Katzenbach and Smith define a team as a work group with a shared commitment (Katzenbach & Smith, 1993a).

The literature on the use of champions is very large, starting with the work of Peters and Waterman, who appear to have coined the term in their book *In Search of Excellence* (Peters & Waterman, 1982). Champions are described as people within an organization who overcome internal barriers such as lack of resources or administrative resistance. A typical management approach to champions would be to identify people like this within the organization and encourage them. Bailetti and Guild took a slightly different approach. In order to give their teams maximum exposure to new opportunities, they sought to identify champions in other companies and arrange for direct contact with them.

Bailetti and Guild defined champions of innovation as "individuals or small groups who have recently championed the adoption of innovative solutions addressing leading edge needs of their firms" (Bailetti & Guild, 1991a). The teams used a two stage process to identify champions. First they looked for "innovative solutions to leading edge needs of interest to the team" according to four criteria: the solution occurred in the last six months, addressed a leading edge need, the firm adopting

the solution had made a significant financial commitment to its development, and the team believed the need being addressed would be general in the marketplace in the next five years. Then the team looked for the individual who most strongly believed in the need for the solution, made the case to the firm for a development commitment, and frequently interacted with customers as a result of their involvement in the solution.

The diffusion of innovation literature has identified change agents as a key element in the innovation process (Rogers, 1962; Rogers, 1983). In the first two studies, innovation teams were sponsored by a group of senior managers known within their organization as "acceptors." These people provided the resources for the activity, the topic area to be explored and -- to varying degrees -- committed themselves to act on the recommendations of the team.

The research method called for a series of studies which focused on the information gathering, processing, and presentation activities of teams as they took information from champions and digested it for change agents. The studies are included as chapters in the dissertation. Overviews of each study are provided below.

Study One

The first study needed a team in the telecommunications services industry willing to have the researcher participate as a member of the group. They also needed to be willing to undertake the "champions of innovation" technique. Geographic proximity which allowed this researcher to participate full time with the team was also a consideration. With the help of university/industry contacts a team fitting these requirements was identified in a large telecommunications

services company based in Western Canada (herein referred to as ABC Telecom).

The author was a full time member of an innovation probe with the ABC organization for a period of six months. The author remained in contact with the team for a further 18 months, collecting additional data in questionnaires and interviews. Based on that experience, a second study was designed.

Study Two

The second study called for a comparison between the activities of the champions of innovation team at ABC Telecom and a team in a different organization. The objective was to compare the teams' experiences and probe into some unexpected findings from the first study. In order to keep the two cases as nearly comparable as possible, the objective was to identify a team with a similar mandate, method and topic, in a similar industry and time-frame. For service/product comparison purposes, a team which was primarily concerned with telecommunications equipment was sought. A team at "DEF Research" was identified through a university/industry contact and they agreed to participate.

The author interviewed six team members from this comparable team and an additional five participants in related studies in that organization. The comparisons yielded some insight into the differences between pre-development innovation activities at services firms and those in product firms. The research also probed the unexpected results obtained in the first study related to the importance of the relationship between change agents and innovators to see if it was present in this setting as well.

As a result, a third study was undertaken to look more closely at this relationship in slightly different circumstances.

Study Three

The objective in the third study was to extend the generalization of the results by going beyond the first two firms studied without losing track of the basic aspects of the research: teams, telecommunications service innovation and champions. In order to accomplish this, a scan for exceptional innovators among telecommunications services firms was undertaken. The use of a "champions of innovation" or "lead user" technique was not a factor in selecting participating firms, partly because it was known that this technique was not widely used and the researcher hoped to be able to perform some comparisons of concept formulation arising from a more informal process. A Canadian firm was identified and contacted. When senior management agreed to participate, two teams and innovation processes were identified. Two additional innovation processes in associated firms were identified in the course of the interviews and these people were also studied, for a total of four cases. The four cases represent another example of product/service comparison. Two of the cases are of innovations in telecommunications services, two are telecommunications equipment. A case study research strategy based on interviews was used to collect data.

Study four

The fourth study went beyond the telecommunications services and equipment sectors into a large vertical markets for telecommunications services: banking. Respondents were selected through an environmental scan of exceptional innovators using media and on-line sources. A case study drawn from this research is provided in Chapter Nine.

Limitations of the research

Every study method has some limitations and potential for distortions. The best approach to these concerns is to be aware of these before evaluating the results. The following paragraphs discuss the major limitations and sources of potential distortions in this research along with the steps taken to compensate, correct or eliminate the distortion. If such correction was not possible, a rationale for proceeding in this fashion is described.

Exceptional cases

The most serious source of possible distortion in this research is the emphasis on exceptional innovators. In the first study, the researcher went so far as to introduce an exceptional or novel technique into the organization. By focusing on exceptions rather than using a random sample or attempting a survey, the study has a limited ability to be generally descriptive of the firms in the industry. This was a conscious choice in the design of the research. It does limit the ability of the study to provide a descriptive statement of the state of innovation practice in the studied industries or firms.[38] There are, however, some benefits to this sort of approach.

One offsetting benefit occurs in the ability to use these results for prescriptive recommendations. The research question is not how do firms manage innovation but how can they manage innovation better. As such it is a prescriptive and applied question. In order to address this it is necessary to look for examples of those who do it better. From the outset, however, it was apparent that systematic attention to the formulation stage in new services was rare. It was further evident that service innovation lagged behind goods innovation in both the speed and

the frequency of new products. Yet numerous studies suggested that a systematic approach -- at least with regard to significant innovations -- could improve the process dramatically. The solution therefore was to implement a form of learning from extreme cases.

The lack of a large number of organizations that use some sort of formal management for the formulation process required that the researcher in the first study be pro-active in introducing a concept and in the second and subsequent studies be able to locate and persuade exemplary firms to participate in the study.

The role of "acceptors"

The first and second studies, for which the most depth of analysis was possible, present a somewhat limited view on the role of the acceptor or change agent group. At the outset this was not felt to be a major issue, since the focus was on the activities of the team. As the team activities progressed, however, it became clear that this resulted in a supply-side (or "technology-push") orientation to the research. The team members' experiences, in both of the first two studies suggest that the most important decisions affecting the ultimate disposition of the concepts generated by teams are taken by the acceptor group and their superiors. In other words, innovation within the firm is strongly affected by demand-side ("demand pull") factors.[39] The design of the first two studies did not provide sufficient time or opportunity to learn more about these factors in detail.

This missing element was addressed to some extent in the third and fourth studies by scheduling more interviews with change agents. These were not equivalent in terms of detail or "richness" of data as the contact with team members however. A sociologist studying the practices

f people looking for new jobs -- a problem not unlike looking for new roduct concepts -- experienced the same difficulties in his work. As in his research it was found that the cost of contacting senior managers, oth in terms of time and effort, would have added considerably to the ffort required to complete the research. Granovetter explains his own eliance on the 'supply-side' this way: "While this short-coming etracts from some sort of ideal study, I do not think that it need itiate the usefulness of the results presented here, which are more or ess self-contained." (Granovetter, 1974:8).[40] In the present research, lthough the viewpoint of the change agent would have added to the tudy, here the emphasis is on the communicative acts by which teams cquire, process, and present new service concepts and less on the ecision process by which these are considered for investment. nvestment decision processes, as well as considerations of the arameters that limit team activity, who joins the team, and the esources teams have available, are considered only in passing in this tudy. They have been identified as significant and important variables orthy of further examination.

Major innovation

The third major constraint to this research is the emphasis on ignificant innovation. Incremental, or minor, innovations are the most ommon form of innovation (Mansfield, 1968). The focus on significant nnovation misses the processes that account for most of the changes in roductivity in an industry. The rationale for doing so is twofold. irst, incremental change is already well-served by the innovation anagement processes established in firms. Programs such as the use of mployee suggestion boxes and tracking of customer complaints and

suggestions are well known and widely practiced in both the product and service sectors (Schneider, 1984). Second, the emphasis on major/architectural change is justified by the role this type of innovation plays in acquiring[41] comparative advantage, the adequacy of existing methods for incremental change (or improvement), and the inadvisability of instituting systematic techniques to manage revolutionary or radical change.

Next steps

A research project, once completed, often produces more questions than answers. The present work is no exception. At the outset there was no prior experience with the use of a 'champions of innovation' team in telecommunications services. Through participation with one team and interviews with others a great deal has been learned about such team activities in this context. Additional interviews helped to confirm some of the tentative findings and provided a better understanding of services formulation generally. The choice of team members, resource allocation for teams and competing projects were all identified by informants as key variables in their ability to perform their task effectively.

Endnotes

[1] The importance of telecommunications and especially telecommunications services is treated in detail in Chapter Three.

[2] Under a dozen papers exist in the past two decades. Some representative ones include: (Bowers, 1986a; Cooper & de Brentani, 1991; Easingwood, 1986; George & Marshall, 1984; Langeard & Eiglier, 1983; Lovelock, 1984b; Shostack, 1984; Wind, 1982).

[3] The bulk of this literature emerged in a flurry of activity sponsored by the American Marketing Association, which held special sessions on new service marketing at its annual conferences in the early 1980s (Berry, 1980; Cowell, 1984; Grönroos, 1990; Lovelock, 1981; Rushton & Carson, 1986; Teare, Moutinho, & Morgan, 1990).

[4] Two early studies are (Fuchs, 1968; Regan, 1963). More recently, work by the Economic Council of Canada and the Fraser Institute have addressed the issues of service jobs (Economic Council of Canada, 1990) and the magnitude and continuing growth of the service economy (Grubel & Walker, 1989). Delaunay and Gadrey have published a useful summary of services in economic literature (Delaunay & Gadrey, 1992).

[5] See Guile and Quinn's books on technology and services (Guile & Quinn, 1988a; Guile & Quinn, 1988b) as well as (Harvey, Lefebvre, & Lefebvre, 1992b; Haynes & Thies, 1992; Mitchell, 1990; Morone, Berg, & Pitt, 1990; Sokol, 1992).

[6] In a recent Information Week article, Stephanie Stahl quotes a Bell Atlantic spokesman as saying "Our customers can't live with the 2-to-5-year cycle it takes for us to deliver new services" (Stahl, 1994).

[7] See Monge (Monge, Cozzens, & Contractor, 1992: 253) for a review of several empirical studies that shown higher levels of communication and information gathering associated with higher levels of performance in R & D project groups (Katz, 1982; Keller, 1986; Keller & Holland, 1983) and organizational innovation in general, (Aiken & Hage, 1971; Kanter, 1982; Kanter, 1988). The link between performance and communication is partly explained by Van de Ven (Van de Ven, 1986) who argues that "as individuals have access to more information about available innovations and are more globally informed about the implications of innovative ideas, they are better able to relate the parts to the whole".

[8] The 'diffusion of innovations' literature alone is enormous, as Rogers remarked in the last edition of his classic text by the same name (Rogers, 1983). The bulk of this work, however, looks not at the creation of innovations but the role of communication in their diffusion.

[9] Smith and Reinertsen's work on the benefits to be derived from attention to the 'fuzzy front end' are discussed in more detail below. von Hippel's work on lead users as well as Bailetti and Guild's work on champions of innovation represent the major work that has been done on techniques for formulation.

[10] There is a considerable literature on staged innovation processes. They are also known as "stage-gate" processes after Cooper's "NewProd" system which requires a decision gate upon completion of each stage. The number of stages varies, depending on the writer. Crawford suggests five stages (with 67 sub-stages) (Crawford, 1987), BAH suggest seven (Booz Allen and Hamilton, 1982), Kuczmarski suggests ten (Kuczmarski, 1992), and Cooper and Kleinschmidt identify thirteen (Cooper & Kleinschmidt, 1986). The 'stage-gate' system is widely used in the telecommunications industry, spreading from Northern Telecom, who adopted it in the early 1980s to Bell Canada, Telecom Canada (now Stentor) and several of the smaller telephone companies in Canada. In a recent article, Cooper proposes that stage-gate systems need to be modified to better fit with the high-velocity new product development processes of the 1990s (Cooper, 1994). These 'Third Generation' new product processes will, according to Cooper, "revolve around four F's: the will be fluid and adaptable; they will incorporate fuzzy gates which are both situational and conditional; they will provide for much sharper focus of resources and management of the portfolio of projects; and they will be much more flexible than today's process." (p. 3).

[11] Innovation is dealt with in more detail in Chapter Two.

[12] In the language of economics, change is not outside daily life ("exogenous") but rather intrinsic, or "endogenous".

[13] Studies have shown eighty per cent of a product's final costs are fixed by decisions taken before development begins (Smith & Reinertsen, 1991). Smith and Reinertsen introduce two additional factors: the low cost of attention at the very early stages and the very high (but hidden) cost of not moving quickly enough. People generally think of tangible items such as people and equipment when considering cost. Activities at the 'fuzzy front end' as they call it, typically make few demands on people and equipment. The 'reasonable' manager, therefore, devotes less attention to this area and focuses more on high expenditure aspects of the new product process. This is a mistake, Smith and Reinertsen argue. The real cost of activities at the front end is delays in the project that eliminate subsequent profits when a new product emerges into a mature market. According to Smith and Reinertsen, the cost of delay is often 500 to 5000 times the visible cost of assigned personnel.

[14] Being first on the learning curve means that an organization has an opportunity capture market share and make money at all stages of a product's evolution, even as prices fall when competitors emerge.

[15] There are risks with all first mover strategies as well. The business literature, and in particular the work of such 'business economists' as Michael Porter offers a wide variety and in-depth treatment of various competitive strategies for firms. See, for example, (Porter, 1980; Porter, 1985). These sorts of decisions, however, are not generally the task of an innovation team. Rather their role is to make recommendations on opportunities as they see them. The formulation process from the perspective of management will be the subject of subsequent research by this author.

[16] Timmons, cited in (Bailetti & Guild, 1991b: p 291). See Chapter Five for a complete treatment of the formulation process.

[17] See Chapter Five for a complete discussion of the lead user method.

[18] The literature on this, stretching back to the 1940s, is laid out in a 1986 paper by von Hippel (von Hippel, 1986). von Hippel terms this "The Effect of Prior Experience on Users' Ability to Generate or Evaluate Novel Product Possibilities." The work is mainly from the field of experimental psychology.

[19] These preconditions are described and the rationale for each is explained in von Hippel's work. Essentially, before lead user probe should be carried out four conditions should be present: important trends exist, lead users exist, mutual benefits are possible, and effective methods can be implemented to involve lead users in the new services development process.

[20] More recently, we have seen moves by Bell Atlantic to actively foster the conditions which would empower lead users to create new services on the "Advanced Intelligent Network." The advanced intelligent network, or AIN, is a feature which promises to turn the telephone network into more of an application platform than a switched service. It rides on the existing network with connections to intelligent databases, allowing the company to customize the network though software instructions. According to a recent Information Week article, "Allowing third parties to develop AIN applications has been discussed in the telephone industry for several years. Bell Atlantic says it is making the move now because of customer impatience. "Our customers can't live with the 2-to-5-year cycle it takes for us to deliver new services," a Bell Atlantic spokesman says." (Stahl, 1994).

[21] Notwithstanding certain recent polemics recalling the primacy of manufacturing, such as the challenge by the chairman of Sony Corporation to "Don't just stand there, manufacture something!" (Morita, 1991).

[22] Examples of the self-service economy include the decline in servants with the rise of home cleaning equipment such as vacuums, the replacement of transportation services by private automobiles, and so on.

[23] Wright points out that services have evolved considerably since the days when service meant personal service: "As the automobile brought mobility, mass communications made available more knowledge and growing populations created an increasingly impersonal environment, the old model of services became outdated" (Wright, 1990:149).

[24] Cited by (Quinn, 1988:18).

[25] Eiglier and Langeard refer to this as "servuction" (Eiglier & Langeard, 1987).

[26] Two recent articles on service strategy include analyses which take the value chain concept and build on it. Jean Harvey has written about on value linkages (Harvey, Lefebvre, & Lefebvre, 1992a) and Normann and Ramirez describe something they call the "value constellations" (Normann & Ramirez, 1993).

[27] A similar finding comes out of the marketing literature. Schneider points out that "service employees at the boundaries of the organization …are more likely to be aware of the new kinds of services likely to meet customer needs" (Schneider, 1984).

[28] As defined by the participants, typically a combination of one or more elements related to achieving expected market share, profitability, strategic goals.

[29] See, for example, Chip Bell's "Ten Commandments" for service creation (Bell, 1992).

[30] See Kopp on a new electronic mail system (Kopp & Jadhav, 1986). Numerous examples like this were published in the early to mid-1980s as part of a series of special proceedings of the American Marketing Association.

[31] Shostack, for example, gives a detailed list of steps to be completed when designing new financial services. Following these steps, the reader is assured, will ensure a higher success rate (Shostack, 1984). It is up to the practitioner to create the organizational techniques to deliver the results demanded for the steps. de Brentani's (de Brentani, 1989) and Easingwood's (Easingwood, 1986) review success factors for new financial services are similar in that they identify the results of goods practice (the stages and outcomes) but leave the problem of delivering those results unresolved.

[32] Anthropologists refer to this problem as the 'conversation on a bus' problem -- how many buses would you have to ride before topic "X" came up in its natural setting?

[33] In this sense the technique serves as a heuristic device -- enabling the researcher to clearly see a previously murky set of relationships.

[34] This benefit carries with it a danger, however. The researcher might be seen as being 'attached' to the introduced technique and as a result respondents downplay their concerns or criticisms. The researcher may equally come to believe so strongly in the technique that they will not or can not hear criticism.

[35] The role of the participating researcher is described in greater detail in the first case study.

[36] This varies slightly in study four, where some individual innovators were interviewed.

[37] Although the change agents were sufficiently senior managers to initiate this process, typically they were not responsible for the kind of allocation of resources required to take advantage of a major opportunity. In those circumstances the managers had to "sell" the idea to their superiors. As it turned out, this was a significant impediment to innovation.

[38] Such studies have been carried out recently, however: see Page for a survey of all firms (Page, 1993) and Martin Jr. and Horne for a survey of services firms (Martin Jr. & Horne, 1993).

[39] These and the other results are presented in summary form at the end of this chapter and in fuller detail within the studies themselves.

[40] Elihu Gerson has pointed out that "...trying to put together the perfect study is a sure way to no study at all, because there can't be a perfect study. Hence, the insistence that all possible objections (philosophical or otherwise) be met before the study is conducted is an insistence on no research at all. The problems with any given study are corrected in the studies that follow it, not by the *a prioristic* reasoning that comes before it." (Gerson, 1993).

[41] The acquisition of competitive advantage is thought to come from major/architectural change (i.e., innovation) while the maintenance of competitive advantage is the responsibility of minor/incremental change (i.e., productivity). See Henderson and Clark for more on the theoretical background to "architectural change" (Henderson & Clark, 1990). See Morone for several interesting case studies of firms which have effectively combined these two forms of change to maintain and enhance their competitive advantage (Morone, 1993).

Chapter Two

The Context for Innovation Research

This chapter examines the context for management of technology research. It addresses the question "What are the major influences on the identification and quantification of new technical and market opportunities for telecommunications services?" Three factors are identified and discussed: globalization, competition, and innovation. The chapter argues that the first two factors, globalization and competition, have a cascade effect. As a result organizations must rely heavily on innovation to generate wealth.

The chapter begins with a discussion of the term "technology" in the context of innovation.

Technology

This thesis is about management of technological change. It is important to note, however, that "technological" in this context is not confined to hard technologies but includes processes and practices. The people who create technology often have the "softest" definition for the word:

> When asked to define technology the technical community tends to think in terms of skills or disciplines, for example, heat transfer, solid-state physics, circuit analysis, that is, the input to the process. Business management, on the other hand, tends to think of technology in terms of products or systems, that is the output of the process (Mitchell, 1990:955).

A broad interpretation of the word "technology" has a long history of academic study (Innis, 1964, c1951; Innis, 1972; Leiss, 1990; McLuhan, 1962; McLuhan, 1964). Recent writing also tends to view technology as more than just machinery. In the MacDonald Commission report, for

example, the commissioners point out that we should not limit our thinking about technical progress to material objects:

> Fundamentally, technical progress embraces any innovation that improves the way we do things. Thus, innovations in the political decision-making process or improvements in the organizational design of corporations or non-profit organizations have no less potential to increase wealth than has the discovery of a better carburetor. We must keep in mind that technological change involves a broad process of improvement in products, methods of production, organizational design and management, and, indeed, in the organization of political institutions and the operation of the political process (Royal Commission on the Economic Union and Development Prospects for Canada, 1985:89, Vol. II).

The concept of innovation is tightly coupled to this view of technology. Lundstedt uses the term "new knowledge" in his discussion of innovation, and Brooks argues that technological innovation is not merely things but ideas:

> It has been traditional to define technology in terms of its physical embodiments, as novel physical objects created by man to fulfill certain human purposes … this is too limited a view and one that is becoming increasingly obsolete … technology must be sociotechnical rather than technical, and a technology must include the managerial and social supporting systems necessary to apply it on a significant scale (Brooks, 1980:23).

This approach is echoed in the work of several other authors. For example, van de Ven states that "An innovation is a new *idea*, which may be a recombination of old ideas, a scheme that challenges the present order, a formula, or a unique approach which is perceived as new by the individuals involved" (Van de Ven, 1985: 105, emphasis in original).[1] Drucker defines innovation as the application of knowledge to tasks that are new and different (Drucker, 1992).

One commentator on Western economic growth suggests that institutional innovation (e.g., the form and size of the organization) was the most important factor in the dominance and continuing success of capitalist economies (Rosenberg & Birdzall Jr., 1986). Institutional

innovation, Rosenberg argues, is what gives capitalism its dynamism and its ability to deal with the uncertainties unleashed by technical change.

> The freedom to conduct experiments is essential to any society that has a serious commitment to technological innovation or to improved productive efficiency. The starting point is that there are many things that cannot be known in advance or deduced from some set of first principles. Only the opportunity to try out alternatives, with respect both to technology and to form and size of organization, can produce socially useful answers to a bewildering array of questions that are continually occurring in industrial (and in industrializing) societies (Rosenberg, 1991:2).

Globalization

Technological innovation in companies in Canada is frequently discussed in terms of an imperative -- we must innovate or fall behind. This section and the one which follows explores two aspects of that imperative, beginning with "globalization". Virtually every commentary on the economic troubles of the 1990s cites "globalization" as a major source of these problems. One might ask, "What is globalization, and why is it having such a strong impact on Canadian firms at present?"

Globalization has been described as the process by which much of the total world economy takes place as trade beyond the boundaries of a single nation. Trade between nations has grown rapidly throughout the modern era. Ongoing and long established trends (political, social, technical and economic) push capital, goods and people further and faster around the world every year.

But trade, by itself, surely does not explain the concern. Although current levels of world trade are high, trade growth in the 1980s and 1990s does not begin to match earlier increases. In the 1960s, for example or, for that matter, in the 1880s and 1890s, trade grew even

more rapidly (Doern & Purchase, 1991). Paul Krugman points out that globalization of trade, investment, even migration can be traced back even earlier:

> Most historians of the international economy date the emergence of a truly global economy to the Forties -- the *1840s*, when railroads and steamships reduced transport costs to the point where large-scale shipments of bulk commodities became possible. International trade quickly surged. By the mid-19th century, the leading economy of the day, Great Britain, was exporting more than a third of its GDP -- three times as much as the U.S. exports today. Britain eventually invested 40% of its savings overseas every year. And an era of mostly open borders was marked by international migration that dwarfs anything recent. (Where was your great-grandmother born?) (Krugman, 1994:110)

If the current levels of global trade are significant but the rate of growth is not unprecedented and by itself would not warrant concern, why has there been so much recent attention to "globalization"? The answer to this question lies in the fact that trade is only the most obvious sign of the current form of globalization. Modern "globalization" derives its power from the combination of increased trade and two other phenomena: an unprecedented growth in multinational actors (evidence of this is the share of world trade controlled by trans-national corporations[2]) and increasing numbers of problems that need to be addressed on a global scale.

Increased trade is defined as an increasing movement of goods, services, capital, ideas and people across national borders. Increasing numbers of trans-national corporations (TNCs) is part of a larger trend that is seeing the rise of global corporations as well as supranational political and scientific entities. Global problems are a familiar issue and reflect the fact that a growing number of problems and situations inherently involve more than one country and cannot be effectively addressed by domestic actions alone, for example the environment, world

population growth, AIDS and other health issues such as climate and environmentally induced starvation (Science Council of Canada, 1992b). These three factors (global exchanges, global entities, and global problems) are the essential ingredients of the modern form "globalization" and the reason it is unprecedented in its impact.

Canada has a long history as a trading nation. Like many former colonies, Canada was founded on the basis of trade. Unlike the United States, Canada did not go on to develop an economy dominated by domestic activity, despite several attempts to do so.[3] Among the Organization for Economic Cooperation and Development (OECD) countries, Canada is one of the most active trading nations (in terms of percentage of GDP) and leads the world in many trade categories (especially primary resource industries such as pulp and paper[4]). Consideration of the issue of globalization from a Canadian perspective must therefore take into account the fact that we are, unlike our neighbours to the South, a "small trading nation."

Others refer to Canada as an "open" economy. The report of the Royal Commission on the Economic Union and Development Prospects for Canada (MacDonald Commission) defines "openness" as the ratio of trade in goods and service to GNP. A country with many exports and imports, like Iceland, reports approximately 57 per cent of GNP from trade. Of the G-7 countries, Canada has long had one of the highest ratios -- 29 per cent in 1929, 24 per cent in 1938, and 26 per cent in 1978. In comparison, in 1978 the U.S. reported 10 per cent, Japan 12 per cent (Royal Commission on the Economic Union and Development Prospects for Canada, 1985:46, Vol. II). Demers states that "in Canada's open economy, exports amount to 26 per cent of the GDP—the second highest of the G-7, after Germany"

(Demers, 1992:156). Others suggest that the ratio is closer to 30 per cent (Marshall, 1991).

The notion of smallness refers to the fact that not only is our domestic economy small relative to other developed countries, but until recently we were the only G-7 country without easy access to a market of over 100 million people. The need for such market access was a major plank in the free trade advocates' platform in the 1980s. Canada's subsequent signing of the Canada-US Free Trade Agreement (FTA, 1989) and later the North American Free Trade Agreement (NAFTA, 1993) suggests the extent to which that argument has succeeded in this country.

Beyond the three aspects of globalization identified above ("global exchanges, global entities, and global problems"), the overwhelmingly common feature of globalization is the extent and pace of change, in all parts of economic, political and social life, that it brings with it.[5]

> The necessity to be competitive derives in great part from the new international order characterized by an unprecedented degree of international economic dependence. World trade has increased very rapidly since the end of World War II, reaching an average annual growth rate of 4.5 per cent in the 1980s, while world output grew at an average annual rate of only 2.8 per cent during the same period. Trade is being regarded as the engine of growth not only by developing countries but also by Western economies. The past five years have seen a cementing of the Canada-US trade relations through the Free Trade Agreement and an acceleration of the economic integration process in the European community (EC), as well as a substantial increase in trade among East Asian countries including Japan. The annual growth rate of world foreign direct investment increased from 10.2 per cent in the early 1980s to 23.6 per cent in 1986-87. Investment and technology are flowing through international borders at an ever-faster rate due in great part to technological advances in telecommunications and information network systems, which have led to the proliferation of financial linkages across countries. Industry is becoming increasingly "footloose" and decentralized, particularly in the high technology sector. There is no longer a need for firms to locate all their operation in only one country. Production takes place where costs are the lowest. The important considerations that come into play in the determination of a desirable location for particular business operations include the economic and

> political climate of the country being considered as a potential site. (Demers, 1992)

Thurow argues that these changes underline the increasing advantages of what he calls "German/Japanese" capitalism (that is, capitalism that is communitarian and producer oriented) over an "Anglo-Saxon" capitalist model (based on individualism and consumer oriented). Thurow refers not so much to nationalities of capitalism but to styles of capitalism, which can be found in firms from many nations. In a recent book that described seven "cultures of capitalism" Hampden-Turner identified aspects of these "cultures" in firms around the globe (Hampden-Turner & Trompenaars, 1993). It is not surprising that large multinational organizations should reflect many cultures, given the diverse sets of demands they have in working in many locations and the diverse skills they draw upon to operate effectively around the globe.

An increasingly global economy is forcing in a shift in the nature of the capitalist economy and fewer opportunities to "live and let live," at least in an economic sense, according to Thurow. The truth of that statement can be readily seen in telecommunications, the sector which is the focus of this research. Until recently telecommunications in most of the world was dominated by state or privately owned monopolies providing service and telecommunications equipment. Global awareness of problems and solutions has resulted in declining levels of regulation, increasing technical capabilities, and vaulting demand from consumers (business and individuals) throughout the industry. The industry is moving toward competitive service in telecommunications within and increasingly between countries. Competition is growing among service providers as well as equipment providers. Formerly "safe" markets are open to newcomers or companies who were formerly excluded from certain markets

because of institutional arrangements or regulatory fiat. These conditions have been repeated in many other industries world-wide but are particularly acute for information technologies.

Competition

Increased competition implies greater concern to be "competitive".[6] Competitive advantage, was long an obscure and relatively inactive area of economic theory.[7] The classical perspective on competition was useful to explain capitalism of the period prior to and immediately following the second world war, when most domestic economic problems could be dealt with a Keynesian approach and differences between nations could be attributed to differential endowments.

Economic problems of the 1970s and 1980s, most notably persistent economic stagnation combined with monetary inflation (known as "stagflation," see (Olson, 1982)), provided an incentive to economists and policy makers to re-examine some old assumptions. In the United States, Britain and to a lesser extent Canada and a few other countries, policies based on Keynesian economic assumptions -- which called for economic management through attention to the demand for goods and services (hence the name "demand economics") began to be replaced in domestic economic management by an approach that attempted to solve problems through management of supply ("supply-side economics").

While the success of these supply-side initiatives is unclear,[8] it was also an opportunity for a discussion closer to concerns of this thesis. The proposition that emerged was that national "macro" initiatives were largely irrelevant or only of second-order importance. Competitive advantage, in this view, is based in the circumstances and

responses of firms. A group of writers, described by some as "business economists", argued that many of the old assumptions about comparative advantage were no longer valid (Lipsey, 1993). Beginning in the 1970s, an emerging group took issue with what they saw as a discrepancy between the static, equilibrium model of competitiveness as described by comparative advantage, and the dynamic, disequilibrium they saw in the competitive world of firms.[9] In particular, they remarked that competitiveness was not so much due to existing factor endowments but how those endowments are combined with abilities: ability to innovate, ability to manage change within the firm, ability to acquire and deploy technology, ability to force alliances with suppliers and create value for customers (Porter, 1979; Porter, 1980; Porter, 1985).

As this revised picture of firm competitiveness emerged, Porter and a few other economists turned their attention to the issue of national competitiveness (Porter, 1990; Reich, 1991; Thurow, 1992). Porter's analysis suggested that an analysis of national competitiveness should consider economic *inputs* such as skills, productivity of labour, capital, and materials instead of *output* measures (e.g., relative trading position).[10]

Output measures describe the status of an economy relative to its trading partners but do not suggest how to effect an absolute improvement. More recent definitions of competitiveness are based on an economy's ability to change for the better, the ability to upgrade itself (Porter, 1990; Porter, 1991). In other words, competitiveness is based on an active, not a static, definition.[11] In this regard national competitiveness begins to reflect the real experiences of firms and their experience in developing and deploying new technology.[12]

There is growing acceptance among the Canadian business community that many of today's problems stem from inadequate management, limited vision, and importantly, insufficient investment in the technical infrastructure and technological development required by a modern competitive organization:

> Although the World Economic forum's World Competitiveness Report has ranked Canada at number five, the country's business acumen was ranked near the bottom of the international list. The country's natural resources, education, health care system, government and social stability boosted its ranking. Finance minister Michael Wilson says Canadian business has failed to tackle the emerging service-oriented and technological economy of the 1990s. Government has offered Canadian business a number of incentive programs to increase its spending on research on development. Measured as a percentage of gross national product, Canadian business has contributed 55% to research and development compared to 70% in the United States and 74% in Germany. Canadian management expertise and employee relations have also contributed to the low ranking. (Bradbury, 1991:30)

Michael Porter's "diamond" framework for competitiveness considers three important facts:

> First, no one country is competitive in all or most industries; rather, countries are competitive in particular industries and industry segments. Second, each country exhibits distinct patterns of international competitive success and failure. Third, countries tend to succeed in clusters of industries rather than in isolated industries, and the pattern of competitive clusters differs markedly from country to country (Porter, 1991:23).

When Porter applied his model to ten different countries, his principle conclusion was:

> Sustained international competitive advantage results from ongoing improvement and innovation, not from static advantages. Here innovation is defined very broadly, to encompass technology and the full spectrum of activities relevant to competing in the marketplace. Creating competitive advantage requires that its sources be relentlessly upgraded and broadened (1991:23).

The problem with traditional analysis of comparative advantage was that it assumed a static (or only very slowly changing) factor

endowment. The experience of firms in the 1960s and 1970s suggested that factors were changing much more rapidly than previously anticipated.

In the area of natural resources, new processes and synthetic materials have rapidly altered the value of endowed factors. One of the earliest experiences with this was in the case of rubber production, which moved from natural to synthetic rubber during the second world war and never turned back.

Capital accumulation, also thought to occur only very slowly in a nation as a function of the national saving rate and total productivity (allowing savings in the first place), was replaced with global capital markets. Advances in telecommunications, data processing and economic cooperation mean that money moves around the globe with startling speed. A local entrepreneur no longer needs to wait for a capital infusion from local financiers (Thurow, 1992). This thesis focuses on telecommunications carriers, one of the most important players in this international flow of ideas and capital.

Human capital, which early economists such as David Ricardo and Adam Smith thought could only be "upgraded" at a generational pace, was revealed as immensely flexible once the management practice of 'training' was widespread. Again, second world war experience particularly in the United States of training vast numbers of people in a very short time proved to be a turning point (Drucker, 1974).

The most important issue, however, has been the growing appreciation among economists that there is a vital role to be played by technology and that access to technology is not equitable around the world.

If the global economy has more competition, industries are forced to become more competitive

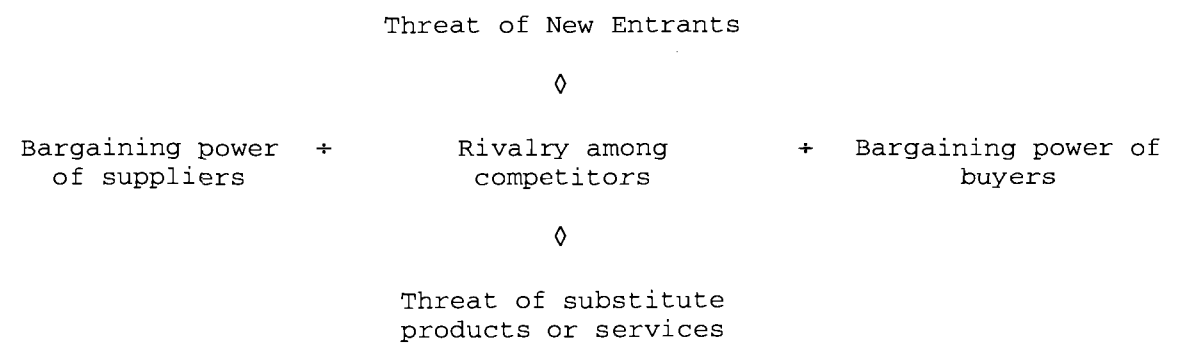
This section discusses the idea of organizational competitiveness in more detail and introduces several aspects of competitiveness that are particularly pertinent for the research to be undertaken.

Competitive Advantage

The process of defining in what ways a business was competitive, how it got to be competitive and how it could stay competitive was extensively developed by Michael Porter in a series of books and articles in the late 1970s and early 1980s (Porter, 1979; Porter, 1980; Porter, 1985).

Competition within an industry is the result of the interplay between the firm and five processes, Porter argues. A diagram is a useful way of understanding these forces and how they act upon the firm:

Figure 2.1: The five competitive forces that determine industry competition



Source: (Porter, 1979:141).

Porter describes the impact of these forces in this way:

> The five competitive forces determine industry profitability because they shape the prices firms can charge, the costs they have to bear, and the investment required to compete in the industry. The threat of new entrants limits the overall profit potential in the industry, because new entrants bring new capacity and seek market share, pushing down margins. Powerful buyers or suppliers bargain away the profits for

> themselves. Fierce competitive rivalry erodes profits by requiring higher costs of competing (such as for advertising, sales expense, or R&D) or by passing on profits to customers in the form of lower prices. The presence of substitute products limits the price competitors can charge without inducing substitution and eroding industry volume (Porter, 1990:35).

The other competitive consideration for firms is position within the industry. Position is determined by two things, the firm's approach to competitive advantage and its competitive scope.

The two major forms of competitive advantage are lower cost and differentiation. Lower cost is "the ability of a firm to design, produce, and market a comparable product more efficiently than its competitors" (Porter 1990:37). Differentiation is "the ability to provide unique and superior value to the buyer in terms of product quality, special features, or after-sale service." With lower cost a firm may earn a higher rate of return than other firms by charging an equivalent amount. With differentiation, a firm may earn a higher rate of return by charging a premium price.

Competitive scope refers to the different varieties of products available within segments of an industry. The telecommunications services industry, for example, offers segments such as local (wired) service, cellular service, paging services, long distance services, data services and many more. A firm may choose to participate in one, a few or all of these segments but would have to be aware that different strategies are appropriate to each segment. Long distance services might have relatively little "rivalry among competitors" (as was the case in Canada, until recently), while another segment, such as paging might have a great deal more.

In the context of the growing globalization of markets, businesses may also shift their competitive scope by participating in an international market in particular industries. British Telecom, for example, has chosen to follow this route with many of its new products and services.

Value Chains

Innovation has been described as a crucial element for growth and competitive advantage. While there is broad agreement about this the assertions do not make clear exactly how this is accomplished. Porter's concept of a "Value Chain" provides us with an insight into the mechanism whereby value is created, and exchanged and advantage is gained. The notion of a value chain is based on the idea that everything a company does in order to bring a product or service to the customer can be divided into discrete steps. Each of these steps has value for the buyer, and if the cumulative value is greater than the cost then company can make a profit. The profit occurs not only from the mark-up of services and resources but also the phenomenon we recognize as 'the sum of the whole is greater than the sum of the parts' — the interaction between the discrete elements provides the opportunity for creation of value. The firm gains advantages over its rivals by performing this mix of activities more efficiently (to achieve lower cost competitive advantage) or differently (to achieve differentiation competitive advantage).

From the point of view of this research, the way in which firms gain competitive advantage is to develop new ways of doing these discrete activities, using new procedures, and new technologies.[13] In other words, through innovation. Innovation, as we noted earlier, is simply

the process of developing new ways of doing things and applying them commercially. As we move to discuss service innovation the importance of a broader perspective on innovation, one that focuses on new knowledge as opposed to new things or devices, will become increasingly clear. As Porter notes, innovation "can be manifested in product changes, process changes, new approaches to marketing, new forms of distribution, and new conceptions of scope" (Porter 1990:45). The resulting changes can give a company an advantage over its rivals when they do not see it or are unwilling or unable to make the change.

Industries sometimes change dramatically and this is an opportunity for a new firm to gain competitive advantage. As noted above, an existing firm may have a hard time making the shift to new forms of competition (Dosi, 1982; Foster, 1986), for a variety of reasons. One of the most difficult things for a firm to accomplish is to recognize and appreciate the impact of innovations that come their way. We know, for example, that firms need to have a certain minimum level of skills in order to appreciate the value of new information. Without that knowledge the new information is useless (Cohen & Levinthal, 1990).

Given the difficulties of maintaining an edge when technologies change, companies must be concerned with sustaining competitive advantage gained through innovation. The source of that advantage is what makes it vulnerable, according to Porter, and this is eloquently described in his review of the comparative advantage of nations. It was once thought that raw materials or cheap labour was sufficient to maintain a competitive advantage but as countries all over the world are discovering, there is inevitably someone willing to work a little cheaper or sell their coal, or iron ore or trees for less. The same

logic applies to firm's competitive advantage. Advantage based on labour or resources will inevitably be matched (or bettered) by competitors. Porter identifies a set of what he calls "higher-order" advantages, including "…proprietary process technology, product differentiation based on unique products or services, brand reputation based on cumulative marketing efforts, and customer relationships protected by high customer costs of switching vendors" (Porter 1990:50). These are more durable in the sense that they are not as easy to match as are low labour costs. They are expensive and difficult to imitate so the competitive advantage is more easily sustained.

A firm can also sustain advantage by continuing to invest in their advantage. This can be in the form of technology research or sales and advertising. Local telephone companies currently enjoy an unparalleled infrastructure that reaches virtually every home in their regions. This has taken a long time to build up and a newcomer would have a very difficult time replicating it. Firms in this situation must always be on the look out for technological shifts, such as wireless telephones, that can render such an advantage obsolete.[14]

Firms can also use innovation to establish multiple, parallel sources of advantage. Innovation in the area of technology can be followed up with service and distribution innovation. A computer company might offer a new line of innovative portable computers and then use its global presence to offer a global repair facility, something of value to the owners of traveling computers.

Finally, in order to create sustainable advantage a firm must continually upgrade. In this way the firm is always moving the yardstick by which other companies are forced to measure themselves. This means

going beyond the investment in the original advantage, described above, to developing new sources of advantage. The key here is to combine the first two strategies, namely creating parallel advantages and establishing them in higher order areas, sometimes at the expense of existing advantages. This later point is a key reason that many firms cannot make the transition to new levels of competition, as the vacuum tube manufacturers did when moving to transistors. Old skills were not transferable and they were not willing to upgrade or acquire the new skills.

Costs and benefits of competition

For consumers, competition ensures that prices are not artificially high, and quality is acceptable. Inefficient or sloppy producers will be driven out of the market by those who can provide better quality and prices. Competition is also good for the economy as a whole by ensuring resources are used efficiently and new firms with new ideas are encouraged.[15]

Technological change is in some ways a double-edged sword for companies. A necessary response to a competitive market, change is also disruptive, difficult and expensive.[16] While innovation increases overall social welfare over the long term, in the short term it can reduce corporate profits for some firms. The point to be taken from this is that innovation is not *by definition* profitable or socially efficient. New products and services must be evaluated on a case by case basis.

The idea that innovation and competition are difficult and expensive should not suggest to the reader that they are not worth pursuing but rather to be aware that there will at all times be reasons to resist

following this course of action. The resistance will come in many forms. Economic resistance may come from management in the form of plans to develop "niche" strategies or propose protective tariffs or regulatory schemes. All of which are attempts to avoid competition. Social resistance may come from employees worried about de-skilling and job loss, a public reluctant to change, and public and private institutions that are comfortable with existing relations.

Innovation

If, as we have argued, competition means organizations will rely more heavily on innovation we must ask ourselves, what is innovation? Lundstedt tells us that "Innovation is the process that begins with an inventor's insight and ends with a new product or technique in the marketplace" (Lundstedt & E. William Colglazier, 1982). Most authors prefer to break this down into a finer distinction. One definition, from the Batelle Laboratories in the US, provides an "operational definition" of innovation, which not only carefully distinguishes invention from innovation but also innovation from the diffusion of technology:

> A technical innovation is a complex activity which proceeds from the conception of a new idea (as a means of solving a problem) to a solution of the problem, and then to the actual utilization of a new item of economic or social value. Innovation should be distinguished from scientific discovery, which involves the observation of a previously unknown or unobserved phenomenon or the acquisition of new knowledge; although relevant discoveries may be incorporated into the innovation. Innovation should also be distinguished from invention, which is the creation of a novel product or process, or a concept of a means of satisfying a need. The invention, however, may provide the initial concept leading to the innovation. Finally, innovation must be differentiated from diffusion of technology, which one author has defined as "the evolutionary process of replacement of an old technology by a newer one for…accomplishing similar objectives", but which we have broadened to include the extension, improvement, and wider use of existing technology…the period of innovation is assumed to extend over a bounded interval of time, extending

> from first conception of the idea for the innovation to first realization, when the first commercially successful embodiment of the innovation entered the marketplace (Batelle Columbus Laboratories, 1973).

Weiss and Birnbaum also distinguish between invention and innovation, based on earlier work by Freeman (Freeman, 1974) and Layton (Layton, 1977). For Freeman as well as Layton, invention is the discovery and development of technology and innovation is the adoption and use of inventions (Weiss & Birnbaum, 1989:1015). Linden describes innovation as more of a "hunter-gatherer" (i.e., finding) than a "farmer" (i.e., cultivating) activity (Linden, 1992).

Technological change can be understood to have three stages: invention, where the new product or service is first imagined; innovation, where the new product or service is introduced to the market; and diffusion,[17] which includes the production and distribution of an invention throughout the economy (Hall, 1986:1). It can be further divided into product and process innovation, and innovations targeted as final and intermediate goods.[18]

Table 2.1: Types of Innovations

Product		Process
Final	Intermediate	
Changes in the *specification* of goods and services sold in the market for final consumer demand	Changes in the *specification of goods* and services sold in the market as intermediate inputs in other parts of the economy	Changes in the *nature of inputs* or the way in which they are used in any given production process.

Source: Adapted from (Hall, 1986:1)

This last distinction is useful but misleading in that it suggests that the origins of the changes are somehow related to the change themselves. At least four major drivers of innovation are commonly cited in the literature: changes or influences from consumer or customers, influence from suppliers, influence from competitors, influence from regulations and standards (Sheth & Ram, 1987).

Architecture

Another significant feature of innovation is the degree of 'newness' in an innovation. By this we mean the extent to which is differs from existing technology or practice and what are the implications of this innovation for existing markets, technologies and production processes. The literature has commonly divided innovation between radical and incremental improvements. Henderson and Clark extend this typology and add two additional forms of innovation. In addition to radical and incremental innovation they add modular and architectural innovations (Henderson & Clark, 1990). The basis for differentiating the types of innovations is their relationship to the component parts of the product or service. Henderson and Clark are primarily interested in the configuration of the components, not the components themselves. This has important implications for learning, since learning about components will enhance people's competencies and will often occur naturally. Learning about new architectures may destroy competencies (the authors note that it can also enhance competencies) and may not be undertaken without incentives and may require different organization with different people with different skills.

Table 2.2: A Typology of Innovations

		Core Concepts	
		Reinforced	*Overturned*
Linkages between Core Concepts and Components	*Unchanged*	Incremental Innovation	Modular Innovation
	Changed	Architectural Innovation	Radical Innovation

Source: (Henderson & Clark, 1990:12)

Henderson and Clark define innovations that "…change the way in which the components of a product are linked together, while leaving the core design concepts (and thus the basic knowledge underlying the components) untouched, as 'architectural' innovation" (1990:10).

The authors distinguish between types of innovation on the basis of the types of knowledge: component knowledge is knowledge of the core design concepts and the way they are implemented in the component; architectural knowledge describes the way in which the components are integrated and linked into a coherent whole. A component is defined as a "physically distinct portion of the product that embodies a core design concept and performs a well-defined function" (1990:11). The "essence" of architectural innovation, according to Henderson and Clark, is "the reconfiguration of an established system to link together existing components in a new way".

The notion of architectural change is particularly important for services. Services may be more commonly affected by configurations, since the components are people and people don't change as radically as other components.

Locating the study of innovation

This chapter takes a look at three important topics that affect organizations in their ability and incentives to undergo technological change. Each of the three issues to be discussed in this chapter, globalization, competition and innovation, has national and organizational implications. Some contextual issues need to be understood in a broader context. In this thesis, however, a firm level analysis is used to build an understanding of the activities of the enterprise and suggest improvements.

Economists have also begun to understand the problem in these terms. Richard Lipsey points out that a better understanding of the role of technology in economic growth will most profitably come from micro level analysis (Lipsey, 1991):

> The understanding of the causes of the wealth of nations, and the answers to most questions about growth-inducing policies, are to be found mainly at the disaggregated level. … The phenomenon of growth is to be understood almost case by case, industry by industry, and sometimes firm by firm. This leads me to expect much, both from the works of economic historians and from economists in business schools.… *I believe that the main thrust of our research needs to be at the micro level of firms, industries, and government policies which impinge on them* (Lipsey, 1991:20-21, emphasis original).

Those who support policy intervention in matters of innovation are careful to state that the first step to such moves is an understanding of the innovation process, and caution that the first step is a difficult one:

> …the innovation process is much more a network of sequential and simultaneous interactions than a unidirectional flow. Appropriate intervention is, therefore, far from simple and the record suggests that much of it may, in the past, have been misplaced or ineffective (Hall, 1986:3)

When management of technology (MOT) was first identified as a Canadian science and technology policy issue two decades ago, it was

viewed primarily as a research and development management problem to be addressed through formal training and a university-based research program. MOT was thereafter largely ignored in Canadian science and technology policy debates until the late 1980s (Davis & Smith, 1993).

It is curious that management deficiencies were among the last factors to be considered in the Canadian competitiveness debate. Researchers, universities, workers, bureaucrats, the political system, government labs, the tax system, public attitudes, banks, foreign firms, small firms, the resource sector, history, and teachers were all fingered as the weak links in the national system of innovation before the skills, attitudes, and competence of managers became an issue (Davis & Smith, 1993). In the late 1980s, however, the tables turned. In a 1988 report on globalization and competitiveness, the Science Council of Canada was one of the first to put the competence of managers at the center of the innovation policy agenda:

> Improving the scope of governmental support will not in itself be much help...when Canadian managers place so little emphasis on technology and innovation. Canada's most immediate S&T problems are the inability of many of its managers to develop and apply technology to make a profit, the low rank within managerial hierarchies for those with technological expertise, and relatively poor rewards for these people. … (F)ew Canadian companies integrate technology into their strategy formulation process. Too frequently major technological choices are treated as tactical rather than strategic decisions. Or they are viewed largely in isolation, as the concern of the R&D department....The proper exploitation of technology must move to the top of the agendas of Canada's directors and senior executives… (Science Council of Canada, 1988:11,12).

Richard Lipsey points out:

> Many of the failures of North American industry to succeed against competitive challenges from abroad have been the result of management decisions. A later careful reading of *Made in America*[19] supported this view since many of the cases listed there came down to management decisions about such matters as R&D, technology adaptation, or how to respond to new competitive pressures. The key point here is that management decisions, particularly in knowledge-intensive industries, seem to have been behind many such "failures" as (i) slowness to learn about, and adopt,

> superior foreign technologies, (ii) failure to adopt the best new approaches to utilizing a firm's labour force, (iii) too quickly abandoning markets when challenges were first felt from foreign firms, (iv) neglect of product diversification, (v) misunderstanding of the "lean production" technology that lay behind Japan's increasing competitive advantage (which led to such inappropriate reactions as robotizing too many simple manual operations) (Lipsey, 1991:18).

The idea that managerial incompetence is at the root of uncompetitive firms has since become firmly established in the policy debates. A 1992 NABST report on technology diffusion in Canada observed that:

> The critical factor governing whether a firm remains competitive is the awareness and commitment of the senior managers of that firm. Too often, these managers are not aware of the pace of change in competitive firms around the world. They do not take advantage of the support infrastructure and programs which are available to them. They react too late, if at all, to the opportunities of better technology and to the need to change management concepts and procedures to permit their firms to reach quickly and responsively to market demands and challenges. This lack of awareness and motivation has been identified as the most serious impediment for (sic) technology acquisition and diffusion in Canada (NABST, 1992)

The remainder of this thesis is an exploration of how telecommunications firms address some of these issues in their innovation activities.

Endnotes

[1] van de Ven cites Zaltman, Duncan, and Holbek (1973) and Rogers (1983) (Rogers, 1983; Zaltman, Duncan, & Holbek, 1973).

[2] See, for example, (Crane, 1993). The U.N.'s 1993 World Investment Report reports that "By the early 1990s there were about 37,000 transnational corporations in the world, with more than 170,000 affiliates or subsidiaries." The stock of foreign investment in billions of (constant 1985) U.S. dollars has also been increasing rapidly. In 1980 it was $448.2, by 1985 it had risen to $685.3 and by 1990 the number was $1,496.1.

[3] See for example, R. T. Naylor (Naylor, 1972).

[4] While pulp and paper and other resource industries are export intensive they are not necessarily the most important for Canada in terms of absolute value.

[5] Some of these impacts include: the collapse of the Soviet Union, the decline of importance of a resource base, the decline in importance of past wealth with rise of global capital markets (Thurow, 1992).

[6] The word "competition" is preferred in this thesis in the place of the uncertain and politically charged term "competitiveness", although it is not possible to avoid it in all circumstances.

[7] Competitive advantage,as it was called, relied on the premise that there was little to be done about competition between nations, since it was based on endowments. In the 1970s competition theory emerged as a highly active area of micro and macro economic theory. The classical theory of international competition is based on the static economic model of comparative advantage first described by David Ricardo in 1817. In this analysis, nations have equal access to technology and factors of production do not leave the country although they might move from one industry to another within the nation when circumstances change. Nations excel because of their factor endowments, either in the form of natural resources, saved capital or human abilities. The long lag in changing any of these factors (forests to grow, money to be saved, people to be educated) was thought to make them essentially unchangeable, at least for the purposes of classical economic theory.

[8] Supply side arguments have been termed "voodoo economics" by some, including George Bush, although later he was obliged to defend and implement many of these policies.

[9] According to Lipsey, "The behaviour of rational economic agents is constantly threatening to create a rent-seeking[9] society rather than a wealth-creating one" (p.19) What he means by this is that people try to create rules and regulations that will protect their present positions. Because the economy is constantly evolving these protected positions become an inflexibility and therefore a drag on the system. It might be possible for "Schumpterian creative destruction" to act as a

counterweight to this rent-seeking behavior, says Lipsey, but in an oligopolistic economy a government enforced competition policy will be required to ensure that individual advantage doesn't overwhelm the common good. In Canada, many more industries and professions can be considered oligopolistic than in the U.S.

[10] Research cited in the 1985 MacDonald Commission report attempted to define national competitiveness and concluded that the term meant "effective use of resources" (Royal Commission on the Economic Union and Development Prospects for Canada, 1985).

[11] Much of the debate on competitiveness focuses on productivity. Global competitiveness, in this view, is strongly related to productivity, particularly "factor productivity" (Purchase, 1991).

There are two commonly used measures of productivity, capital and labour productivity and total factor productivity[11]. Of the two, total factor productivity is more comprehensive and useful for our purposes here as it takes into account qualitative progress: improvements to the production process or labour and capital resources, as would result with the use of better technology, better trained workers and better management.

Unfortunately, Canada is doing very poorly in terms of factor productivity. While all OECD countries have experienced a slowing of growth since the high growth postwar years, Canada has been consistently second last (after the US) in productivity growth. One of the key problems has been our slow growth in technological innovation and human resource development (Crane, 1992).

The other area of concern is the declining competitiveness in the very industries that have given Canada its commanding trade advantages in the past -- natural resources. One reason for this declining competitiveness is the impending problem of depletion (Porter, 1991). What is more important, many natural resources are subject to the development of alternative sources of supply, either entirely synthetic, from new sources in developing countries or new techniques that make other country's supplies more economic. A typical example of the latter problem is the development of new pulping techniques that allow Brazilian and Chilean producers to effectively compete with Canadian pulp producers by allowing them to use their faster growing but lower quality trees to make top quality paper.

The debate on productivity, while important, is not a central concern in this thesis. Here the focus in on innovation -- the application of knowledge to new tasks -- rather than productivity -- the application of knowledge to existing tasks. These two concerns should not be thought of as a dichotomy but rather anchor points on a continuum. Between the two extremes there will be applications of innovation to productivity and vice versa.

[12] Some would ague that the notion of national competitiveness itself is unhelpful.Paul Krugman, an American economist, argues that "strategic traders" like Reich and Thurow confuse the issue by equating corporate competitiveness with national competitiveness. Unlike inter-firm

competition, Krugman argues, national competition is not a 'zero-sum' game (Krugman, 1994).

[13] As competitiveness can also come from achieving lower cost of production, these "new ways" might include identification of lower-priced inputs that are as efficient as higher priced inputs. To the extent that these low-cost inputs are not merely found by change, the process to develop and acquire them is a form of technological innovation.

[14] Changes in demand (customers want multimedia telephones beyond the capacity of the network) or regulation (government rules that local access lines must be shared by competitive long distance suppliers) also affect this sort of asset.

[15] It should be noted that while the 'push' to innovation from competition is recognized, there is debate among economists as to whether it is the primary driver. Additional influences on a firm's innovativeness include the 'pull' from potential monopoly profits resulting from an innovation (Globerman, 1994). In a 1966 study of *Invention and Economic Growth*, Jacob Schmookler analyzed

> nearly 1000 major inventions in 4 industries (farming, railways, oil-refining, and paper-making) around the world between 1800 and 1957. Where a stimulus for the invention could be identified, in was in nearly every case an economic one (i.e., the invention was needed for some industrial purpose); not in a single case was the stimulus a particular scientific discovery (Anonymous, 1993:18).

[16] In addition to economic disincentives to innovation, there are human and social impacts as well. At the level of the organization, innovation inevitably results in disruption of comfortable positions and forces hard decisions and may require selective inducements (public and organizational policies and programs to encourage retraining, for example). Some of those decisions will be with regard to workers who will either have to be retrained or laid off when new technology or systems make them obsolete. Calish and Gamache identify three stumbling blocks encountered by organizations attempting to change: top management's psychological and emotional resistance to change, pervasive misconceptions about the definitions of a new product or venture, and the inability to distinguish between what is fundamentally new and what is cosmetically new (Calish & Gamache, 1981:21).

[17] Note the important distinction between diffusion of innovations and technology transfer. Diffusion means getting the innovation into the hands of the consumer of that innovation. In Porter's term the innovation is moving down the value chain. Technology transfer is more of a parallel operation, in which an innovation jumps from one site to another at the same point in the value chain. Diffusion of camcorder technology would result in the purchase of camcorders by consumers or wholesalers. Technology transfer would allow camcorder manufacturers in another company or country to produce similar devices. Note that technology transfer is sometimes also used to refer to the process of moving technology from a central lab to the operating divisions.

[18] The problem with this later distinction is that one person's final product is another's intermediate good. Machine tools, for example, leave the machine tool factory as final goods but arrive at the automobile manufacturer as an intermediate good.

[19] See (Dertouzos, Lester, & Solow, 1989).

Chapter Three

Why Formulation, Why Telecom, Why Service?

This chapter provides the background and rationale for the selected area of inquiry. It presents an answer to the question of why the focus on firm initiatives at the very early stages of innovation in telecommunications services. The chapter examines this question in stages. First, why the very early stages of innovation? Second, why telecommunications and why services?

Innovation, or "new product development" (NPD) marks the birth of a new product. For many years marketing practice looked at products in terms of their life-cycle, i.e., they have a birth when they arrive on the market, a period of rapid growth as they become popular and displace competitive products, then a declining period as competitive and improved versions are introduced, and finally a "death" when they are withdrawn from the market to be superseded by another product. Overall strategic thinking has also started to use the life-cycle metaphor and it is in this sense that the term is used here. When used in this way the concept encompasses aspects beyond the product life cycle. One typical definition of product life-cycles[1] includes "design and development, production or construction, utilization, operational support, phase out, and disposal" (Fabrycky & Blanchard, 1991:10). What is missing from this analysis is the role of new products in competitiveness and strategic planning for an organization. The typical product life-cycle analysis simply assumes a new product concept exists, and so one then must decide on how to take it from beginning to end, without much regard for why a particular one would be developed or why

it would be removed beyond immediate profit and loss problems. In this thesis the stage of "design and development" is of interest but special attention is paid to the earlier stages where the decision is made of what to develop, not merely how to do it.

At one time there was some debate on whether it was even possible to manage innovation. This has since changed considerably, although there is still a healthy regard for the "chaos" inherent in the innovation process (Quinn, 1985). Peter Drucker is one of the best known writers on management who advocate a systematic approach to innovation (Drucker, 1985). A great deal of this systematic approach has emerged from academic and practical research in two areas: project management and R&D management and identification and refinement of the "stages" within the innovation process as a whole.[2] In other words, managing the process well. While there is ample justification for paying attention to the overall innovation process, it makes even more sense to intervene at the very early stages, when a development project may not have emerged yet and where operational definitions of new products are still being formulated.

The discussion in Chapter Two emphasized the importance of distinguishing between invention and innovation. The chief distinction is that innovation is the proving of ideas in a market. This crucial transformation is made during the "formulation" stage. Formulation is defined as "the production of an operational definition of an opportunity for a new product which is both desirable to, and attainable by, the firm" (Timmons, 1990). Formulation techniques attempt to enhance a firm's ability to tap the essence of success in a competitive market: a product or service concept that delivers extra value for customers. An

approach to the innovation process that gives adequate attention to both of these imperatives is crucial for success.

As de Bono argues in *Surpetition*, doing things right is necessary for competitiveness but it is not sufficient for success (de Bono, 1992). Recent initiatives by businesses in the area of total quality management (TQM) (Deming, 1985) and business process re-engineering (BPR) (Hammer & Champy, 1993) suggest that the 'doing things right' message is being heard. But those types of initiatives are not sustainable competitive advantages. Success requires going beyond doing things right to 'doing the right thing.' How can we know what that is?

One approach (discussed in more detail in Chapter two) is to develop products more quickly, thereby ensuring more market feedback as well as more 'times at bat' in a given period. Considerable research indicates that if you reduce the time spent getting a product to market, you more than compensate for slight increases in costs due to the overhead of that speedup (Smith & Reinertsen, 1991; Stalk, 1988; Stalk & Hout, 1990a).[3] The role of fast development in telecommunications products and services has been described by Keen (Keen, 1988).

Profits for the organization who gets to market first are typically higher, and that organization gets the first benefits from reduced costs due to larger volume and 'learning by doing' (Arrow, 1962). As prices decline, the faster competitor should be able to take advantage of declining costs even as margins get smaller. Being early to market also extends a product's sales life (Rosenau, 1990; Smith & Reinertsen, 1991).

Competing on time

The rapid pace of new product development has emerged as one of the key areas of competition in the current decade and it is one of the core elements of this research. While there are considerable benefits to developing products and services more quickly, it is particularly important to shorten the initial phases of this process.

Most commentators agree that business has become a much tougher, more global game since the 1970s and 80s. Gupta and Wilemon identified three reasons firms attempt to accelerate new product development: increased competition, rapid technological changes, and changing market demands (Gupta & Wilemon, 1990). Managers imagine that innovation will be the answer to these forces but they are unable to develop new products fast enough for turbulent, shifting markets. While waiting for a big breakthrough, a firm risks losing market share to smaller, faster innovators (Stalk, 1988).

Considerable recent research has described the advantage gained by moving quickly in the innovation process.[4] The first firm to exploit a new technology or process can gain an advantage that in some cases is enduring. Some of the early mover advantages include: economies of scale, reduced costs through cumulative learning, establishing brand names and customer relationships without direct competition, getting the best distribution channels, best locations for facilities, best sources for raw materials (Porter 1990:47). Clark and Fujimoto identify three major advantages to reducing the time to market:

- it contributes to better market forecasting at the concept stage of development;
- it compresses the model renewal interval, which increases the opportunities to modify designs and make better use of technologies; and

- it enables firms to produce products more quickly in response to competition (Clark & Fujimoto, 1991:106).

Another approach, which also requires rapid innovation, is a "fast follower" strategy. Here the emphasis is on identification of opportunities to lower cost through production skills or distribution resources rather than identifying un-met market needs. These types of strategies are examples of what Stalk and Hout refer to as "time based competition" (Stalk & Hout, 1990b). This dissertation explores time based competition that uses interval reduction at the formulation phase of new service innovation.

The benefits of moving quickly include: extended product or service sales life, increased market share, higher profit margins,[5] and increased perception of excellence (Clark & Fujimoto, 1991). Stalk and Hout identify six internal and six external advantages of being a fast innovator:

The internal advantages include the following:

- The latest technology can be used closer to the time of introduction.
- Faster realization of cost reductions as new products with more cost effective designs displace older, less effective designs.
- Dramatically improved quality.
- Lower development costs because programs are completed sooner with less money lost to rework, waiting, reviews, etc.
- Improved working environment since employees can more closely identify with their tasks and can enjoy more new product experiences in the same interval of time.
- A very much improved sense of control of one's destiny since, with faster development times, vicious cycles are broken and customer needs can be forecast over shorter time horizons.

The external benefits include:

- Taking the position as a technological or idea leader.
- Higher price realization in the market from having a fresher product or service offering that customers find more desirable.

- A position in the minds of customers as an innovator that is reliable and responsive, even while products or services are adjusted through successive introductions to get closer to the optimum definition.
- The ability to attract and lock up the most attractive channels of distribution, which like to be able to differentiate themselves by offering the latest innovation.
- The ability to set standards by being the first with innovations and to use market response to establish the standard.
- Improved market share (Stalk & Hout, 1990a:22).

Product and service sales life is extended simply because early introduction does not mean early obsolescence. In most cases people switch products relative to the options that are available, not because they are tired of the product. This effect is compounded if there is a "switching cost" to the product. That is, if you are committed to a product you will stick with it (LP records make a requirement for a record player, for example) and the first person in with such a product will have the longest run on the market.

Market share can be enhanced by being out more quickly because in the initial stages at least you have all of the market. In some products this is particularly important. Computer software for example, has this attribute, as people buy additional software to be compatible with what they already have.

Higher profits are possible with early introduction not only because of the price freedom available at the beginning because of a lack of competitors but also the advantages gained in learning how to produce the product or service means economies of scale sooner than competitors.

While it is sometime hard to quantify the value of a reputation for innovation, it is nonetheless an additional benefit from being a fast innovator. Firms such as Apple Computer and 3M are seen by their

customers as being 'fresh and innovative' (Smith & Reinertsen, 1991:5-6).

The overall effect of these factors, David notes, is that "For companies in highly competitive technology-based industries the issue is not solely the introduction of new products but also how to accelerate the product development process" (David, 1984).

The benefits of shorter new product development cycles include direct competitive advantage from better products that cost less to make, indirect competitive advantage from making competitors' products obsolete, breathing new life into products which may be mature, and finally, changing the whole shape of the company to move from a mature or declining industry into a new vital one. Stalk and Hout describe how Honda was able to do this when it moved from motorcycles to cars (Stalk & Hout, 1990a:21-24). Traditional telephone companies tried to do the same when they moved from the regulated land-line business to the competitive world of cellular communications.

All is not roses, of course, for the fast developer. Halliday notes some of the problems (Halliday, 1993) of moving too fast (customers get fed up with constant change) and Stalk and others have also reported some of the problems involved in the quest for product development speed (Stalk & Webber, 1993). Nonetheless, faster development times are becoming the norm in many industries (Stalk, 1988; Stalk & Hout, 1990b; Stalk, 1993).

Most of the time reduction and quality improvement effort to date has been focused on the development and deployment aspects of product life cycles (Rosenau, 1988; Rosenau, 1990; Smith & Reinertsen, 1991; Uttal, 1988). In addition to the TQM and BPR initiatives, whole disciplines

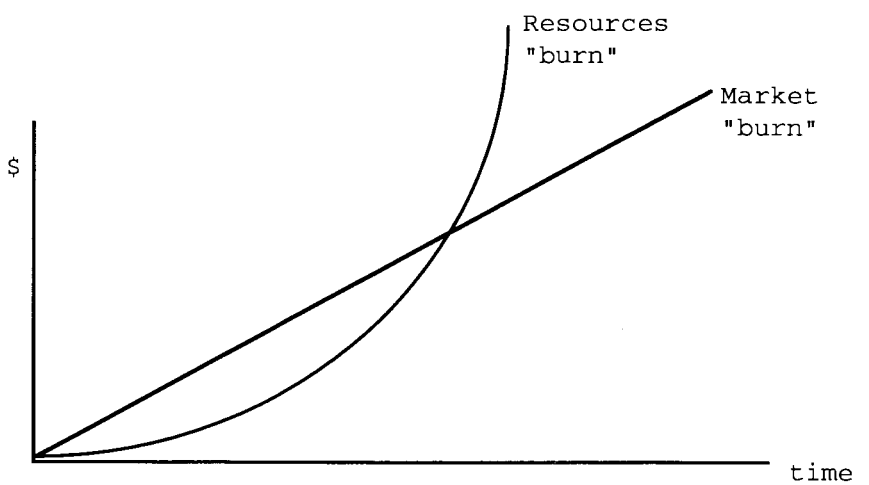
have sprung up in areas such as concurrent engineering (for compressing development times) (Reddy, et al., 1993) and "just in time" delivery (for compressing deployment times) (Cusumano, 1988). Compression of the 'pre-development' process, however, has not been subject to the same degree of attention, despite predicted benefits (Smith & Reinertsen, 1991).

Some practical experience in telecommunications products suggests that the time spent at this stage could be increasing.[6] Certainly there is increased money being spent on pre-development activities. In 1968, Booz Allen and Hamilton (BAH) suggested that more effort should be devoted to the front end of the development process. In 1982 BAH reported that predevelopment expenditures had grown from 10 per cent of expenditure on product development in 1968 to 21 per cent in 1981 (cited in Smith & Reinertsen 1991:52). The Product Development and Management Association (PDMA) recently updated this research. While their research does not reveal dollar costs, they do note that the first phases of new product development process (which they define as concept search, concept screening, concept testing, and business analysis) occupy 32 per cent of total elapsed time (Page, 1993).

Intensive efforts in the 1980s resulted in remarkable progress in compressing the cycle time in the development and deployment of new products and services. Page reports that "fast new product development cycle time and time based competition have become the norms for the 1990s" (Page, 1993:280). At the beginning of the development cycle or "fuzzy front end" progress in time compression and quality improvement has not been as rapid (Smith and Reinertsen 1991:43). This is ironic, since the 'fuzzy front end' is arguably the cheapest and best place to

concentrate these activities (Smith and Reinertsen 1991:43). The benefits are particularly striking when one compares the "burn rate" for development dollars with the "market burn" one gives up by not having a product in the market. Smith and Reintertsen argue that development costs typically follow a curve, with low costs initially but rising rapidly once development starts. The opportunity costs of not participating in a market, however, follows a much straighter line -- in fact it is greatest in the early days before your competitors have introduced a product.

Figure 3.1: Market and resources "burn"



Actually rates of "market burn" no doubt vary by industry, but the existence of a differential is sufficient to justify increased attention to the front end.

Given these benefits, one might wonder why has so little attention has been paid to formulation in the past? Some suggest that it is because of its amorphous nature. If it has no "handles" (schedule,

budget, performance objectives) and no deviations (since there is no plan to deviate from), then 'management by exception' can not get a handle on it.

Another reason for a lack of attention to formulation is that it does not appear to be expensive, so it does not warrant extra effort. Since it is not 'costly' (one or two people, perhaps) financial oriented management might decide to focus on large expenditure items. What they are missing, of course, is that the real cost is not the people, it is the cost of delay which could amount to between 500 and 5000 times the visible costs (Smith and Reinertsen 1991).

The other key element to formulating ideas is evaluation. In fact, in the small amount of literature that concerns itself with pre-development innovation management, a significant percentage is oriented to evaluation techniques that purport to pick winners from losers. Robert Cooper's work is typical of this research (Cooper, 1985; Cooper, 1990; Cooper & Kleinschmidt, 1987). While it certainly is important to have some mechanism in place to rank and weed ideas (these are often called 'gating' systems, where projects have to pass through 'gates' on their way to final release in the market), nothing that is done in this process ensures the qualities of the ideas in the first place, nor does it suggest how to come up with those ideas more quickly.

The importance of telecommunications

That telecommunications should have a special place in discussions of globalization, competition and technological change is not surprising. Most analysts regard it as not only an important industry in terms of

size, past growth and predicted growth, but a lynch-pin in the evolution of an 'information economy' (Bar & Borrus, 1987).

> The telecommunications carriage industry, together with the equipment-manufacturing industry, is a major source of economic activity in Canada, employing some 125,000 people and generating more than $21 billion in revenues in 1990 (telecommunications carriage, $15 billion; equipment-manufacturing $6 billion). Canada's Northern Telecom is the fifth largest manufacturer of telecommunications equipment in the world, behind AT&T (U.S.), Alcatel (France), Siemens (Germany) and Ericsson (Sweden). This industry is also Canada's leading high technology industry; its R&D expenditures of $1.4 billion in 1990 represent about 16% of Canada's total R&D effort for that year (Canada. Department of Communications, 1992).

Canadian interest in the industry is, if anything, greater than in other countries for historical[7] and political[8] reasons. A recent Department of Communications document identified the policy goals for telecommunications:

> Canadian communications policy must continue to take the initiative in a world economy that increasingly is characterized by global considerations. The goal of current policy initiatives is to build upon Canada's acknowledged excellence in telecommunications. Modification of the regulatory environment during the 1980s to introduce competition among vendors of advanced telecommunications services was commensurate with that goal. The process of attaining that goal will generate innovative telecommunications services which will improve the competitive position of all Canadian industries (Canada. Department of Communications, 1992).

As Science Council of Canada reports, these policies have both national and international implications:

> Telecommunications is the foundation of the information revolution and, as such, constitutes one of the world's fastest growing and strategically most important sectors. Canada is a strong world player in this high-tech technology sector. Three key forces drive the emergence of global, competitive markets in the telecommunications sector: the worldwide trend toward a more liberalized regulatory environment, the rapid growth in demand for both existing and new telecommunications services, and rapid technological progress (Science Council of Canada, 1992a:v).

The aspect of the telecommunications industry that is poised for the greatest growth is not equipment, an area in which Canada is already an

effective global competitor, but in services. Although this is not an area in which Canadian telecommunications carriers have concentrated on in the past, the patterns of national and international growth suggest that this is where opportunities lie. Companies such as British Telecom and AT&T have made global service delivery a key element in their plans for the future.

> The telecommunications carriage industry's share of the Gross Domestic Product (GDP), at factor cost and 1986 prices, has grown steadily from 1 percent in 1970 to 1.8 percent in 1980 and 2.7 percent in 1990. In 1990, the industry achieved a growth rate (after inflation) of 8.6 percent, which compares favourably to the 0.3 percent (at factor cost and 1986 prices) attained by the national economy. This industry's 2.7 percent of GDP in 1990 surpassed the performance of Canada's traditional economic mainstays. For example:
>
> | | |
> |---|---|
> | Agriculture and related services | 2.3 percent |
> | Logging and forestry | 0.6 percent |
> | Mining | 1.2 percent |
>
> (Canada. Department of Communications, 1992)

One problem suggested by "information economy" scenarios is the extent to which telecommunications is treated as a "black box" by proponents of future growth through new information technologies and networking (Mansell, 1990). This is not to suggest that telecommunications is not up to the task but rather to identify the need to focus attention on the problems and specific configurations of a telecommunications network and services so that they can meet those expectations. As Mansell points out, "there are complex and considerably different ways in which new technical capabilities can become embedded in domestic and international telecommunication infrastructure" (1990:501).

Using telecommunication to compete on capability

Capabilities based competition has been described as the successor to competition based on time (Stalk, Evans, & Shulman, 1992). Competing on capabilities is based on four basic principles: a focus on business *processes* instead of markets or products, transforming those processes into something that creates *value* for the customer, the ability to make those transformations is based on crucial investments in a winning support *infrastructure* (training, telecommunications, computing, warehousing), and a top level *commitment* to this process by the company chief executive.

The concept of competing on capabilities is important for two reasons. First, the capabilities Stalk *et.al.*, describe are fundamentally skill based and have a service orientation. For this reason they will be important to developing the research questions in this thesis. Several of the examples the authors use suggest a broader trend, namely the "servicization" of industry[9] in which the importance of the product declines and the importance of what it *does* increases.

Secondly, the importance of telecommunications not only supports other predictions of the centrality of communications in the economic prosperity of the nation's firms but suggests that other firms will begin "competing on capabilities" as well and investing in similar infrastructures.

The importance of service

Some have argued that the services industry matters more than manufacturing because 70 per cent of the economy is services, and only

20 per cent is manufacturing (the remaining 10 per cent is accounted for by agriculture, construction and mining).

The large size of services in the economy is really just the tip of the iceberg. As Krugman points out,

> …much of a dollar of "manufactured" exports indirectly represents services such as health care purchased by the manufacturer. (GM's largest supplier is not a steel company but Blue Cross/Blue Shield.) Input-output studies of the U.S. economy give us a pretty good estimate of the hidden service component of manufactures trade: Only about 60% of a dollar of manufactures sales represent manufacturing value added. (Krugman, 1994:115)

Canadian figures for services as a percentage of the economy are similar to U.S. figures.

Some commentators go so far as to regard products as merely tangible services. "There are no products -- only services. Think of every product you buy or sell as a service. In other words, look at what it does, not what it is," says Rosabeth Moss Kanter of Harvard Business School. Peter Drucker, in *Management: Tasks, Practices, Responsibility*, (1974) says managing service institutions is "likely to be the frontier of management for the rest of this century" (Drucker, 1974). Long time manufacturing companies, like IBM, or Caterpillar Tractor, are creating service divisions that generate more revenue than the equipment side of the business (Heskett, 1986). As of 1993, IBM Canada does more business in service than hardware sales, and not just service of its own equipment, but a multitude of services in all areas of information technology and management.

Until recently a technology strategy was most commonly thought to have only product or process implications. What we are seeing now an increased attention to the role of services in the formulation of business strategies (Quinn & Paquette, 1990). The attention to services

is not to suggest that business strategy is turning away from a technology focus:

> Service activities -- rather than products -- now provide the central thrust for most corporate strategies. Properly identifying and developing these "core activities" -- and systematically building strategies around them -- can create a cohesive strategic posture that lasts for decades, and can successfully support an extremely diversified product line. **Many of these core activities are technology based** (Quinn & Paquette, 1990:2, emphasis added).

According to Heskett, "development of the product line, involving the design and introduction of new service offerings, has been cited as one of the more difficult challenges of managers in the service sector." (Heskett, 1986:84).

Trends in Service Innovation

In the area of technological development, Heskett notes that services often involve a multitude of transactions, many of them small, which need to be processed rapidly, inexpensively and accurately and the results combined, analyzed, and transmitted to managers. "The increased speeds and accuracy levels of communications and information processing technologies, accompanied by geometrically declining costs, have had a profound impact on individual service providers." (Heskett, 1986:158) The impact has been felt in increased competition, competition from smaller companies, and as a result, increasing deregulation in industries formerly seen as sacrosanct "natural monopolies." The impact has been felt in dollar terms as well: "New technological investment per service worker nearly doubled in real dollars between 1975 and 1982, and it appears to be increasing at the rate of about 8 percent per year".[10] This rapid and dramatic investment in information technology[11] emerged as one of the controversies surrounding the movement to a service economy.

Significant investment in information technologies for services, including airline ticket processing, credit card billing and collection systems, and "back office" automation of banks and other financial industries, took off in the 1970s and continued throughout the 1980s and 1990s. As a the world economy shifted to global competition, productivity was increasingly scrutinized in all industries and disturbing "facts" about service productivity, especially with regard to productivity attributable to investment in information technology, began to surface.

Services industries have long been characterized as unproductive, and considered "second rate" compared to the truly productive manufacturing industry (Delaunay & Gadrey, 1992). It is only recently that researchers such as Noyelle have begun to raise questions about the pessimistic statements about productivity in the services sector made 25 and even 50 years ago (Noyelle, 1990).[12] The pessimistic argument for growth in the service sector is based on the assumption that services are less productive, hence it takes a relatively larger number of people and resources to deliver value. Several analysts have noted that the European service sector is smaller and suggest it is because Europeans invested more heavily in information technology for services. Thierry Noyelle and Thomas Stanback argue that the measurements for productivity are scandalously bad and provide no basis for the conclusions drawn. They propose an alternative theory -- that growth in services is because of growth in demand. They list several reasons for this increased demand: rapid product and market transformation, changes in input-output linkages, the rising importance of foreign trade and global specialization.

The idea that productivity may not be lagging in services is important to work in the area of service innovation, because it has long dominated debate on the value of a service economy, leading many prominent commentators to issue calls to abandon services and return to "the basics" of manufacturing.[13] In this view, attention to service innovation is misplaced because it deflects attention from the supposed real sources of value and competitiveness -- manufacturing of goods. Quinn and others have also supported Noyelle's theory with similar criticisms of the data on productivity and suggestions of reasons for the increased demand. Giarini's notions of large growth in manufacturing demand for services (intermediate services) is echoed in numerous other places, including Gershuny (Gershuny, 1978), Grubel (Grubel & Walker, 1989), and most recently Lipsey (Lipsey, 1991).

Innovation

Within the Canadian corporate context, service innovation, like all other aspects of service, is very important simply because of the large size of the service sector in this country. It is estimated that as much as three quarters of the Canadian economy is wholly or partially within the service sector as reflected in figures for employment and GNP. Canada is not unique in this respect; most industrial countries report similar data.

Not only are the service industries large, but they are predicted to grow and be instrumental in future growth (and productivity) in all other sectors. In order to understand this it is necessary to take a step back note that there are many parts to the service economy.

Service Innovation: what is it?

Innovation is part of the product life-cycle, in which new products are developed (created) and then deployed (manufactured and sold) and later withdrawn. Both of these aspects are subject to intense scrutiny within companies, as firms attempt to increase quality while reducing the time it takes to complete each phase. Service innovation is generally regarded as a special case of new product development, so we should first clarify what development means.

Product development processes vary, depending on the level of formality and structure. Some are formal and structured, others are informal with few stages. Typically, the process includes a sequence of steps which lead to the decision to launch a new product. A common version of a list used to support such a process is the one provided by Booz, Allen and Hamilton (1982):

a. opportunity identification/market profile analysis
b. idea generation
c. idea/concept screening and evaluation
d. business analysis
e. concept development and testing
f. product prototype evaluation
g. development of the marketing mix
h. market testing
i. launching of product

An innovation is an idea that is determined to be commercially viable and suited to the company doing the development.[14] The initial phases of the development process are known as "formulation".[15] It is here that a company attempts to identify viable ideas and decide if they fit with the company's capabilities and strategy. Most of the research to date on new product development has been on the later stages ("d" through "i").

Little attention has been paid to how new ideas are identified (steps "a" to "c" in the above list).

Service development is often regarded as similar to product development. Many new product development textbooks mention services only in the introduction, when they assert that when they say "product" they really mean "product and service". In this fashion, service innovation is in many respects the "step-child" of product innovation, which has a longer history of research and practice. One reviewer noted over 1600 articles published on new product development, while fewer than two dozen existed for new service development (George & Marshall, 1984). There are some indications, however, that this is changing. In 1983 the American Marketing Association sponsored a symposium on Developing New Services. The Marketing Sciences Institute designated "new service development" as the number one research priority for the Institute (George and Marshall 1984). This produced a small flurry of articles in the marketing literature of the mid-eighties.[16]

Among researchers interested in new service development there would seem to be a consensus that while many of the models used in new product development could be usefully applied to services, some significant differences do exist. The differences arise from the differences between products and services: numerous lists exist which differentiate between the two. Typically they include items such as the difference in the "goods", the difficulty of maintaining quality standards, the involvement of customers in the production process, and the absence of inventories (e.g. Lovelock 1984).

The nature of the good is the most often mentioned aspect of services. Services are, for a person used to dealing with products that

can be picked up and handled, disconcertingly "intangible". In addition, because some services are largely "people-based" as opposed to "technology-based" they are difficult to standardize. Finally, when the customer participates in the production or delivery of the service, as they would in the case of a haircut, for example, quality is difficult to maintain.

These and other features also make the consumer's selection of services somewhat different from products. For example, researchers have identified a much greater perception of risk among purchasers of services than products (George, et al., 1985; Guseman, 1981). Heskett notes:

> One important psychographic dimension whose understanding has provided the foundation for more than one highly successful service is that of perceived risk, including perceived economic, social, legal, or medical risks. Research has suggested repeatedly that customers associate risk more highly with the purchase of services than with goods; customers for services often feel they have less information about services than about goods. Other sources of perceived risk have been the nonstandard nature of many services, the lack of evaluative criteria, and the absence of or difficulties with guarantees against poor performance (Heskett, 1986).

Not only are the customers of a service business different, so are the employees. In many service businesses the lowest paid employees are also those most often in contact with the customer. This makes them uniquely important not just for delivering the 'product' and keeping customers happy but also provide the basis for understanding customer wants and needs.

These three elements -- different products, customers and employees -- result in significant potential differences in the way new services are formulated. A larger element of "intangibility" in the service "product" suggests that more initial research will have to be done in

the idea generation and concept testing phases in order to identify and fully understand "service realities" (Shostack, 1977).

Differences in the way consumers approach service purchases suggests that the type of research will be skewed to more "soft" data collection (Zeithaml, 1988). Since it is much more difficult to produce a "prototype" service, service innovators must "rely more heavily on the tools and skills of psychology, sociology and other behavioural sciences -- tools that in product marketing usually come into play in determining *image*, rather than fundamental reality" (Shostack, 1977).

Differences in the role of employees suggests that they could be a key source of innovation since they are in direct contact with the customers. While some recent initiatives in product formulation make use of employee input, these have not been front-line but rather mid-level management or technical people (Bailetti & Guild, 1991a; Bailetti & Guild, 1992). Service companies will have to go much further "down the chain" in their efforts to tap useful employee insights. Although little research has been done in this area, some initial work with the Mariott hotel chain suggests that follow-up in these directions will be worthwhile (Rethans, et al., 1985).

Endnotes

[1] See Easingwood (Easingwood, 1988) for a useful introduction to the concept that products have a life-cycle.

[2] There is a large body of practical and academic research on the methods to use when developing products. This has generally led to finer and finer definitions of the 'stages' within the development stage as well as following it. One of the best known authors in this area is Robert Cooper (Cooper, 1983; Cooper, 1985; Cooper & Kleinschmidt, 1986).

[3] According to Andersen Consulting, "If a company can deliver a product to market in one-third the time of its competitors, its growth rate will be three times faster and its profit three times greater." See also (Schoonhoven, Eisenhardt, & Lyman., 1990; Stalk, 1993; Uttal, 1988).

[4] See, for example, (Imai, Nonaka, & Takeuchi, 1985; Peters, 1987; Stalk, 1988; Takeuchi & Nonaka, 1986; Uttal, 1988) for the issues of managing the time to market. See also (Stalk & Webber, 1993) on the "dark side" of time-based competition.

[5] Karagozoglu and Brown report that "…in high-growth markets involving short product life-cycles, the overall impact of NPD speed on profitability is compelling. A model developed by McKinsey and company showed that the timely introduction of a product in this specific product-market context, even when 50% over budget, faced only a 4% loss of its profit potential. In contrast, 6 months delay in product introduction, even though on budget, cuts profit 33%" (Karagozoglu & Brown, 1993:204).

[6] In-house research at Bell-Northern Research in 1989 found that the 'pre-development' process was taking an 'unacceptable' eighteen months (Bailetti & Guild, 1991b).

[7] See (Canada. Department of Communications, 1992) for a succinct history of telecommunications in Canada. Atkinson and Coleman report that "Since the very beginnings of settlement in British North America, political leaders have viewed transportation and communications as instruments of both economic and political integration. The Canadian Pacific Railway was built with a view to nation building and Trans Canada Airways (later Air Canada) was created to serve the goal of political integration by setting up an east-west trunk line through which smaller firms could link remote settlements in the north, west and east to the metropole in central Canada. Improving technology for long-distance communications has occupied a similar if less glamorous role in the process of nation building. Harsh winters and widely dispersed settlements have encouraged use of the most modern communication technology available, whether it be the wireless, the telegraph, the telephone, microwave transmission, or direct broadcast satellites. The need to adapt and improve communications technology to serve dispersed communities has brought Canada's scientists and technicians to the forefront of research and development in this field. Canada's geography has required sufficient expertise and inventiveness to give it a

comparative advantage in an industry that is one of the fastest growing in the world." (Atkinson & Coleman, 1989:97)

[8] Bernard Ostry's recent report summarizes much of the debate on electronic communications in Canada. See (Ostry, 1994).

[9] This neologism is intended to capture the other side of the process described as early as 1976 as the "industrialization of service" (Levitt, 1976). In contrast, and in support of the "servicization" thesis numerous recent commentators have started to speak of an era in which 'there are no products, only services' (Kanter, 1989).

[10] Heskett cites a 1983 Business Week article ("A Productivity Revolution in the Service Sector," *Business Week*, 5 September 1983, p. 106, 108) for this claim. This same article claims that money invested in service workers is more productive than money invested in manufacturing workers. Although this claim fell into disrepute in the late 1980s and early 1990s, recent research by Quinn suggests that the productivity of services may have been understated, largely because the measures used do not take into account increases in the *quality* of work.

[11] Services are one of the largest and most advanced users of information technology in the world. The largest computer networks in the world are dedicated to the movement of information related to financial transactions (Barras, 1990). The airline industry is highly dependent on advanced telecommunications and computing systems (Bryant, 1994).

[12] See, for example, Clark (Clark, 1940), Fisher (Fisher, 1935), and Fuchs (Fuchs, 1968).

[13] The Chairman of Sony Corporation, Akio Morita, has written on the dangers of dependency on services. One notable article is titled "Don't just stand there: manufacture something" (Morita, 1991).

[14] In the words of one commentator, innovation is "the development and implementation of new ideas by people who over time engage in transactions with others within an institutional context" (Van de Ven 1986).

[15] At the same time some authors have been advocating a more detailed understanding of the beginning of the product life-cycle, resulting in efforts to understand formulation, others have been working on a better conception of the withdrawal phase. Currently, marketing literature seldom mentions much in withdrawal beyond halting production and perhaps how to deal with issues such as replacement parts for discontinued models. A 'nineties' analysis will require understanding of what happens to products after they leave store shelves and how the process by which products are turned into waste or recycled is managed.

[16] A sample of the articles published by the American Marketing Association between 1981 and 1987 includes (Bateson, 1979; Berry, 1983; Berry, Shostak, & Upah, 1983; Bloch, Upah, & Zeithaml, 1985; Bowers, 1986b; Czepiel, Congram, & Shanahan, 1986; Donnelly & George, 1981; Enis & Roering, 1981; Fisk, Tansuhaj, & Hromas, 1985; George & Marshall,

1984; Gordon & Fisk, 1987; Guseman, 1981; Kopp & Jadhav, 1986; Langeard & Eiglier, 1983; Langeard, Reggait, & Eiglier, 1986; Lesh & Gilly, 1985; Lovelock, 1980; Lovelock, 1981; Lovelock, 1984a; Powers, 1986; Rethans, Roberts, & Leigh, 1985; Robinson, 1983; Schneider, 1984; Shostack, 1981; Surprenant, 1987; Venkatesan, Schmalensee, & Marshall, 1986; Zeithaml, 1981).

Chapter Four

Methodology and data collection

How might one best study a dynamic and ongoing process such as innovation? The first section of this chapter addresses that question by suggesting a research strategy built around case studies. Case studies offer an opportunity to study a problem in its context even while the issue is evolving. It allows the researcher to address some of the how and why questions that most research strategies emphasize but does not require control over behavior as would an experiment. This chapter describes the case study method, its strengths and weaknesses and indicate how it is applied to the research question and data in this thesis.

The second section describes the data and how it was collected. As this was an exploratory study, three 'tiers' of data collection were conducted, with research questions suggesting sources of data. Questions arising from the current tier were explored in the subsequent tier. An additional objective was to slowly broaden the scope of the data collection with a view to generalizing the understanding about the innovation front end. For this reason the numbers represent an 'inverse pyramid' in terms of numbers of teams/organizations examined. At each stage in the process additional layers of questions were explored and additional levels of generalization examined. Limitations of the data are also discussed.

Methodology

Introduction

In this section, the strengths and weaknesses of case research as compared with other empirical methods of investigation are considered for the field of management of technology. Case research is first defined and then placed in a historical context. Criticisms of case research and responses to those criticism are described. The relationship between criticism/response and strengths/weakness is discussed. The section concludes with a discussion of the use of case research in management of technology, specifically service formulation in telecommunication firms.

Case Research: What is it?

As with any field or process that hopes to establish some unique parameters but is based on common words, case research suffers from considerable misinterpretation.

The term "case" is commonly used in two environments not considered in this paper: medicine and teaching. While medical records organize patient data in the form of cases, this is not the sort of approach used here. Nor are the teaching cases developed in business and law schools research instruments in the sense that will be used here. These are better understood as heuristic devices, intended to provoke discussions on particular points.

According to Yin, case research is not so much a "method" as a "strategy" for research (Yin, 1989). Methods are commonly associated with data collection and analysis (such as experiments and surveys). While it is often acceptable to substitute the name of the method with the overall process, such a shorthand is not appropriate in case

studies, since multiple methods are often used within a case. For this reason, the way in which a scientist designs his research, collects the evidence, analyses the data, and finally reports the results is better understood as a research strategy than a method.

What defines a case research strategy? The three aspects of case research that distinguish it from other strategies are found in the following definition.

> A case study is as an empirical inquiry that:
>
> - investigates a contemporary phenomenon within its real life context; when
> - the boundaries between phenomenon and context are not clearly evident; and in which
> - multiple sources of evidence are used (Yin, 1989)

Using this definition it is possible to clearly demonstrate how a case study is different from an experiment, for example. An experiment requires that a phenomenon must be removed from its surroundings in order to reduce the number of variables present. A history might look at events in context but not in a contemporary setting. Surveys may be able to evaluate events in their immediate context but the extent to which the context can be evaluated "richly" (some call this "thick" data) is constrained by the need to limit the number of variables being measured to those that can be evaluated by the respondents.

Finally, it should be observed that case studies need not be restricted to the archetypal "single case" study. Multiple-case studies, and multiple units of analysis within single- and multiple-case studies, are all acceptable techniques within the case study research strategy.

In scientific research, a strategy describes a set of procedures that can be used to investigate a topic in an empirical way. As many of the data collection and analytical tools used by case researchers are

closely linked to qualitative rather than quantitative methods, case research has suffered (undeservedly, as will be argued below) by its association with these supposedly "softer" modes of research.

In part, case research and all forms of qualitative research initially lacked sufficient documentation on what were the appropriate data collection and analytical procedures. This lack has been largely alleviated and there is little serious debate at present that qualitative methods are not appropriate for scientific inquiry. Work by Glaser and Strauss (Glaser & Strauss, 1967) in the 1960s as well as later work by Miles and Huberman in the 1980s (Miles & Huberman, 1984) and Strauss in the 1990s (Strauss & Corbin, 1990; Strauss, 1990) have established the foundation for effective use of qualitative techniques in scientific inquiry.

The next section provides a history of case strategies and then deals with a few of the criticisms of case research and the responses by case researchers to these criticisms. Although there is sufficient focus on statistical analysis and probability sampling in the social sciences to lead one to believe that research has always been done that way, or that case research is a relatively new technique, nothing could be further from the truth.

History

The history of case research suggests that rather than a recent development it in fact dominated the early work in the social sciences, before the development of quantitative methods. Stoecker's history of the use of case research provides the reader with several examples of case studies used to guide the early American experiments in government and military administration. Case studies were also used by Harvard

Business School in the early 1900s in order to solve pressing problems which demanded applied research but lacked administrative theory and quantitative research techniques. Social science use of the case study was both extensive and highly regarded in the early years of this century. Geography (in the study of "locality research"), anthropology (in the study of "exotic and obscure cultures") and sociology (the most famous example being the "Chicago School") all used case research frequently. At the time, proponents of the technique "portrayed their work as being non-quantitative, emphasizing the history and context of their cases, avoiding generalization, and inductively attempting to understand social life from the perspective of the actor, rather than from a deductive theoretical stance" (Stoecker, 1991:89).

Stoecker's history of case research follows its use in American sociology. By the late 1930s, a lively debate emerged between sociologists proposing statistical methods on the one hand and those working on case studies on the other.[1] In the end, qualitative methods fell from favour not only in sociology but in almost all social sciences except anthropology. Mitchell has documented the rapid decline in the use of case research in the sociological literature:

> The change in emphasis is dramatically reflected in the general index of the *American Journal of Sociology* which had its origin in Chicago from which the most important case studies first emerged and which carried the account of the debate in its pages. The Cumulative Index at 1950 carried sixteen references to case studies and case histories. The most recent reference is to Oscar Lewis's discussion of the detailed studies of families in 1950. After that the entry for case studies disappears from the index! (Mitchell, 1983:187).

Theoretical background to the decline

Certainly the rise of probability sampling, statistics, survey methods and computer analysis have been significant factors in the

decline in use of case research. There were also a number of environmental factors at work. For example, sociologists of the period had a declining interest in localities -- one of the key topics of case research at the time. Moreover, there was less interest in applied work[2] and therefore less of an inclination to use the applied techniques such as case work. Finally, as Stoecker notes, "a discipline which became increasingly interested in grand theory also would have difficulty with the peculiar inductive form of American sociological case study research" (Stoecker, 1991:90).

On the one hand we have an increasing criticism of case research methods (and other 'qualitative' techniques) from those who practiced a more 'hard science' approach to social research, and on the other hand there was a turning away, in the mainstream of American sociology at least, from the kinds of questions most suited to case research method.

Practitioners of quantitative techniques were linked to a different epistemology and method of inference. The debate and the direction of attention away from 'soft' questions in the 1950s, 1960s and 1970s reflects a larger debate, that between objectivist and subjectivist schools of thought. Lee uses a set of dichotomies to describe this debate: objectivist vs. subjectivist, nomothetic vs. idiographic, quantitative vs. qualitative, outsider vs. insider and etic vs. emic (Lee, 1989).

It is beyond the scope of this chapter to describe all the positions on this debate. Lee's summary will suffice for our purposes:

> The objectivist school of thought takes the position that social science should be modeled on natural science. The justification it offers is that the methods of natural science are the only legitimate methods for use in social science…Some examples of objectivist methods are those of inferential statistics, hypothesis testing, mathematical analysis, and experimental and quasi-experimental design.

> The subjectivist school of thought takes the contrary position, that social science requires methods radically different from those of the natural science. The justification it offers is that the social reality examined by social science is fundamentally different from the physical reality examined by natural science. Some examples of subjectivist methods are those of ethnography, hermeneutics, phenomenology, and case studies (Lee, 1989:118).

Making these objectivist vs. subjectivist comparisons would normally be the prelude to choosing one or the other (accompanied by a stinging criticism of the inadequacies of the 'loser'). Instead, Lee suggests:

> Whereas case studies are customarily conducted as a form of subjectivist research, they may, in addition, be conducted so as to fit the conceptions of objectivist research as well. …The consequence for the controversy will be rapprochement, in which the subjectivist and objectivist schools of thought are no longer seen as necessarily opposed and incompatible. Instead, …the two schools of though may be simultaneously present, and even mutually supportive, within the same study.(Lee, 1989:119)

While it is not necessary for case studies to include both subjectivist and objectivist aspects,[3] the fact that the potential exists liberates the case researcher in many ways to broaden his or her use of tools and to respond to potential criticism.

The Criticism of Case Research

As noted above, a rise in quantitative methods among the social sciences has resulted in case research being on the defensive in recent years. Most of the criticisms, Stoecker points out, "…stem from the 'N of 1' problem – that there is only one case and, therefore, objectivity is more difficult to maintain, falsifiability criteria are more difficult to meet, and generalization is impossible" (1991:91). Some researchers reduce these to two key problems for case research: a potential for bias and a lack of generalizability. Others expand this to include additional concerns, such as the ability to make controlled observations (related to the bias issue), and the problem of

replication. Each of these sets of criticisms will be dealt with separately before dealing with the responses to the criticism.

Objectivity, or 'bias' is seen first of all as being a problem of 'investigator effects' or 'feelings' of the investigator for the subjects. Other sources of potential bias identified in case research are the use of retrospective reports. All of this is classified as a lack of rigor which results in an inability to ensure reliability and internal validity.

The second problem identified is generalizing the findings of case research. For most critics this is reduced to the notion that only probability samples meet the criterion for representativeness.

The concern over the researcher's ability to make controlled observations is primarily a concern over how to know what is responsible for an observed effect if one can't 'hold constant' other factors. The case researcher, observing events as they naturally unfold, cannot ensure those controls.[4]

Case study reports have also been the source of some criticism, since in the past they have tended to be long and complicated. The quality of case studies depends very much on the quality of the researcher. A particular difficulty in this regard is the problem of applying after the fact peer review.

Objectivist science also calls for replication, a problem for the case researcher who is most likely observing events that are unique and non-recurring. It is extremely unlikely, especially in an organizational setting, that the same event or the same circumstances would happen again.

Finally, it has been argued that the type of analysis that is possible from case research results in data that cannot be expressed in numbers. As Lee notes, "…according to the natural science model of social science research, it is considered preferable, and sometimes necessary to perform the analysis of data and the transformation of propositions through mathematics" (1989:121). The objectivist school of thought regards the lack of formal propositions as a handicap since they can't be evaluated in terms of a formal logic such as algebra.

Responses to the Criticism

The response to these criticisms has been perhaps predictable. On the one hand there has been an attempt to discredit the critics and on the other hand an attempt to make case research more like natural science. In the end, perhaps the best perspective is somewhere in between.

Attempts to make case research more 'objective' are not necessarily the answer, since we are using the technique precisely for its ability to extract subjective information in the first place. Nonetheless, the impulse to make case research more rigorous is a good one and should be followed to the extent that it doesn't impinge on the original incentive for doing case work.

One way that case research can be made more rigorous is by adding techniques and standardizing and systematizing existing techniques. Stoecker identifies a list of techniques used to address problems of internal validity in the case study, including 'triangulation',[5] continual as opposed to sporadic data collection in combination with an 'experimental' approach (pre-test, treatment, post-test conditions), multiple theories within a single case, case comparison, and even 'case surveys.'[6]

As a result of all this attention, internal validity in case research can be much better than it had been, and the appreciation of that status has started to emerge as evidenced in its increasing acceptance in the academic and practitioner literature.[7]

Case researchers have dealt with the problem of replication by pointing out that while a case may in fact be a unique event, it should not be regarded as deficient since to do so is to judge it by the logic of the probability sample, in which one attempts to select cases by their representativeness. The correct analogy is to experimental research, and to see cases as instances of experiments. In those circumstances, one is looking to replicate the findings, not the experiment itself.[8] As Yin points out, to suggest that more cases need to be used in order to make the results more generalizable is to confuse the goals of case research. As in an experiment, the goal is to "expand and generalize theories (analytical generalization) and not to enumerate frequencies (statistical generalization)" (Yin, 1989).

The concern that qualitative results can not be numerically expressed can also be dealt with by reference to natural science. In science there are phenomena, such as evolution, for which measurement is not a possibility or a necessity. Lee remarks that Darwin used words, not numbers, in his explanation of evolution but it is no less logical for that. In fact, "the rules of mathematics are a subset of the rules of formal logic, and the latter may be applied to qualitatively-stated propositions in order to assure that they are logically valid…" (Lee 1989:135).

The problem of external validity has proved somewhat less tractable, although some people have advocated revising case research technique in

this area as well.[9] Much of Yin's efforts to systematize case research techniques, and implement meaningful multiple case designs has been to address these concerns (Yin 1989). More importantly, the flawed logical basis of some of the criticisms, as in the case of the confusing sampling with replication, has been revealed, making the necessity of revision less of an urgent matter.

In some instances, demonstrating the flawed logic in case criticism has been taken a step further, to take the quantitative-scientific critiques and stand them on their head. What several commentators have done is to point out the weaknesses in quantitative methods and identify the ways that case research addresses those weaknesses and go them one better.

As noted above, people have criticized case studies because of the poor quality or excessive size of the output.[10] Yin points out that this confuses the results with the data collection, and that there is nothing that says case study reports can't be pithy. One way to address this issue is by reporting which is directed at a specific audience.

The original objection to the criticism from hard science, that generalizations from cases are impossible, can be addressed by careful consideration of what is going on in a generalization. The objective of doing research is not to be 'quantitative', of course, but to be able to make explanations. Although it is commonly glossed over, using a quantitative research technique to gather data, and statistical analysis to make statistical inferences is quite a separate matter from the logical inferences which must come next if we are to make statements about causal relations.[11]

Mitchell, for example, notes that in quantitative scientific research "the inference about the *logical* relationship between the two characteristics is not based upon the representativeness of the sample and therefore upon its typicality, but rather upon the plausibility or upon the logicality of the nexus between the two characteristics" (1983:198, emphasis in the original). The process of inference is a two part process. Data is collected and patterns are observed and then logical inferences are made as the meaning of the observations. The crucial point here is that *both* qualitative and quantitative research use what Mintzberg calls a 'creative leap from data to explanation.'

At this point one might be satisfied with a 'live and let live' approach between the two types of research[12] but others take the issue one step further to argue that when it comes to explanations, case research is better than statistical analysis. Stoecker notes that "what the case study does best is study *process*, and process is at the very heart of an explanatory method…'Process' is both historical and idiosyncratic, and statistical analysis is unable to capture either of those" (1991:94).

There are further attacks from the qualitative side on quantitative research's alleged lack of 'bias' and its usefulness for applied research,[13] but they begin to take us away from our original point, namely the response from case research to criticisms.

Does criticism equal weakness, do responses equal strength?

It is necessary to know the historical background as well as criticism and responses to that criticism when evaluating a research strategy. As with all aspects of academic life, things have to be put in context. Much of that context will be the competition of ideas that

constitutes the academic 'marketplace.' While these issues can tell us much about how our research will be received, and why it may or may not be accepted, they are not sufficient for making the choice of which approach to take on a research strategy. This is a practical decision.

The academic debates (criticism/response) provide the external environment for such a decision, the internal environment is provided by the strategies themselves and their operational definitions. It is here that the strengths and weaknesses of an approach will be evaluated. Strengths and weaknesses of case research can be categorized according to several dimensions. Some of these might include: tools for success (examples and documentation of procedures); level of difficulty; usefulness in developing theory; and suitability to applied research. The discussion in this section is summarized in Table 4.1.

Table 4.1: Strengths and Weaknesses

Dimension	Strength	Adequate	Weakness
Tools		√	
Difficulty			√
Theory Development	√		
Suited to Applied Research	√		

Case research has suffered somewhat from a lack of a tradition of documenting the procedures that are a necessary and sufficient requirement of a good case study. This problem can be reduced to some extent by following the advice of Robert Yin, but numerous studies exist which were not carried out with the excellent advice provided in his books and articles. In the absence of a "bible" of case research (and the implicit ability to judge work based on whether it measures up to a standard) the criticism of these studies has become a criticism of the strategy itself. This problem has been turned around since the mid-1980s

and numerous researchers now publish rigorous and well regarded results using the case research. Recent distinguished MOT research that used the case research strategy includes Shenhar (1992) (Shenhar, 1992) and Eisenhardt (1989)(Eisenhardt, 1989).

A poorly executed case study is not necessarily indicative of a weak research strategy. It may be that the researcher is to blame. As noted above, case research is notoriously difficult to do and is also difficult to evaluate. It would be a weakness of the technique if poor case research were due to poorly documented methods, though. In this regard, case research has moved from weakness prior to the 1980s to the situation now where procedural information is adequate, if not a strength of the method.

Level of difficulty is an area where case research has not only received a fair amount of external criticism and must face up to the challenges posed by the techniques used in case research. Interestingly the criticism and internal assessment have been in opposite directions. External critics have suggested that case research is too easy, although they are probably confusing easy with sloppiness or a lack of rigor. Among practitioners of case research, there is a recognition that the techniques implied by case research are, if anything, more difficult than normal quantitative research (Yin 1989). This difficulty must be layered on the difficulty of designing good research in a relatively uncharted area and the difficulties posed by using multiple research methods, with the result that the researcher must become a "jack-of-all-trades". Despite progress in recognizing the difficulties posed by case research, the difficulties remain and this must be considered a weakness.[14]

The ability of a research method to suggest new theories, especially in an emerging field such as management of technology, is a key strong point. Developing theories is something typically done by looking at the literature and connecting this with common sense and experience. Doing this in the presence of actual data is difficult, but not impossible. Case research, with multiple methods and an appreciation for the environmental and temporal context of phenomena is particularly well suited to this task. A recent evaluation of the use of case research for building theories suggests that it results in theories that are likely to "have important strengths like novelty, testability, and empirical validity, which arise from the intimate linkage with empirical evidence" (Eisenhardt, 1989). In the context of management of technology, the news is even better: "given the strengths of this theory-building approach and its independence from prior literature or past empirical observation, it is particularly well-suited to new research areas or research areas for which existing theory seems inadequate" (Eisenhardt, 1989:548-549). Clearly theory-building is a strength of case research strategies.

Our final consideration in terms of strength and weakness is the utility of case research strategies in applied research. Much management of technology research is of an 'applied' nature or has applied implications, so this is a particularly significant concern. Given the characteristics of case research already described, one might be able to suggest four ways in which case research is adept at applied research: 1) in situations that are too complex for surveys or experiments, case research can be used to explain causal links; 2) case research can be used to describe the real-life context of a change in business practice

or a competitor's action; 3) a case study is also helpful if it can be used to describe the aforementioned change or action; 4) case research can be helpful in exploring the possibilities when a change or action has no unambiguous outcome.[15] In all of these situations it is case research's ability to analyze real-life situations in context as they unfold over time that lends strength to the strategy. Working against case research in this regard is the potential difficulty and length of time it can take to analyze case research data.

Case research's strength lies in its utility for applied research and its use in theory building, both important features from the perspective of management of technology. It is not strong in terms of documented procedures and overall level of difficulty, although the material that has emerged lately -- Yin (1989) on the overall research strategy and Eisenhardt (1989) on case research and theory-building -- goes a long way to remedying the procedures half of this problem. Significantly, the major weakness of case research, level of difficulty, is something that is entirely within the means of the researcher to compensate for, suggesting that diligent application of the methods should yield good results.

Case Research in MOT: The "Case" of Service Formulation

Case research is only one of several ways of doing social science research. Other ways include experiments, surveys, histories, and the analysis of archival information (as in economic studies). Each strategy has peculiar advantages and disadvantages, depending on three conditions: 1) the type of research question, 2) the control an investigator has over actual behavioural events, and 3) the focus on contemporary as opposed to historical phenomena.

In general, case studies are the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. Such explanatory case studies also can be complemented by two other types -- exploratory and descriptive case studies. Regardless of the type of case study, investigators must exercise great care in designing and conducting case studies, to overcome the traditional criticisms of the method.

Certain types of research questions imply the need for certain kinds of data and therefore strategies for collecting those data. For example, this dissertation examines how service innovation could be done better as well as why it is done the way it is and why certain techniques would or would not afford improvements. This concern for 'how' and 'why' questions is coupled with a desire to propose explanatory links between observations. In other words, this research makes operational links which can be traced over time. These kinds of links are best answered by experiments, histories and case studies.

Research must take place in an environment, and in the case of this research the environment is telecommunications service firms. The degree to which the researcher was able to control behavioural events was extremely limited, ruling out the possibility of doing experiments. Historical or case research techniques were deemed to be suitable given this situation.

Finally, the dissertation looks at contemporary events. How service organizations formulate innovative products and strategies in response to a changing regulatory, technological, and competitive environment begs for answers from living people and actual events. The tools of

historical analysis (records, primary and secondary documents, artifacts) would still be applicable, but the addition of two others from case research (direct observation and systematic interviewing) provides additional insight.

The choice of strategy depends on the kind of questions being asked, the degree of control the researcher has over events and the extent to which contemporary events are the focus. More importantly, we should recognize the extent to which the substance and the form of the research question guides the choice of strategy. If we are looking at "how" and "why" questions, and don't have control over behavioural events and we are looking at contemporary issues, then the case study is the best technique available.

Conclusion

While case research has not always been done well (here we include the academic criticisms of problematic internal validity and practical criticisms of long and poorly constructed reports) these problems can be addressed effectively by a systematic approach to research design. Criticisms of external validity and reliability are reasonably understood as stemming more from mistaken assumptions about the premises of case research and the logical processes that it uses.

The practitioners of case research have responded effectively to the external, academic criticisms of the internal and external validity of the research strategy and have made progress, in the form of textbooks and warnings, on the internal practical problems of procedures and difficulty. The unique demands of MOT, in the form of its status as an emerging field, its concern with a phenomenon grounded in uncertainty -- innovation, and its requirement of applied answers to real problems

indicates that case research strategy and management of technology are made for each other.

Data collection

Data collection proceeded in four stages for this research. In keeping with the practice of grounded theory (Glaser & Strauss, 1967; Strauss & Corbin, 1990), research questions emerged from the data as they were collected. The four stages were useful in this respect as they allowed for the collection in subsequent stages of data that would be useful for understanding questions that emerged in previous stages. Martin and Horne used a similar 'staged' approach to data collection in their study of successful and unsuccessful service firms in the U.S. (Martin Jr. & Horne, 1993). Black and Park's set of cascading surveys in the study of novel modes of research uses a similar progression. As they note:

> [We use] a series of small surveys which vary in audience and method of delivery. The methodology allows for the development of a sample of considerable generality once all the iterations are completed. And, but using a series of small studies, refinements to surveys are easily implemented in subsequent iterations of the study.(Black & Parks, 1993)

In a similar way, the four studies that make up this research each represent both a refinement of the research questions and a search for additional sources of information through different albeit related respondents. Because of the evolving nature of the research, the descriptions of data collection which follow also include a description of the emerging research questions and hypotheses.

Methodological note: Unit of analysis

What is the 'unit of analysis' for this research? In the case of a study of innovation it is not simply a matter of choosing a convenient

standard practice. Research on industrial activity often takes a product type or a firm as the 'unit of analysis.' Is this the appropriate unit of analysis for innovation research?

Research on innovation, especially major innovations, has shown that change comes largely from outside the established industry -- either from small start-up firms, large firms in other industries, or government sponsored change (including purchases, as in military hardware, or regulations, as in emission standards for cars) (Abernathy & Utterback, 1978). In telecommunications services, recent significant change has come in the form of government regulation, technological possibilities created by equipment manufacturers, competition from both wireless and cable industries, and major changes in demand as people increase their use and pattern of telecommunications use. These four sources of pressure for change, largely exogenous to the firm, are described in more detail in Sheth and Ram's 1987 book, *Bringing Innovation to Market* (Sheth & Ram, 1987).[16] Michael Porter lists a similar set of forces in his analysis of competition (Porter, 1979:141) and makes an explicit link between technological innovation and competitiveness in his later work (Porter, 1985).[17]

While many pressures to change come from outside the firm, internal incentives also exist in the form of strategic plans, corporate culture, core capabilities, and incentive schemes. In many ways the internal forces give us an insight into why firms succeed in innovation, while the external forces are responsible for undertaking change in the first place. These two become a useful pair for managing innovation, the 'why' and 'how' of the innovation process.

When change, externally driven and/or internally motivated, causes the units of analysis -- firms and product types -- to dramatically shift, it makes less sense to use these terms as the sole reference point for understanding change. As Abernathy and Utterback point out, "technological change causes these terms to change their meaning, and the very shape of the production process is altered" (Abernathy & Utterback, 1978:43). In order to compensate for this in their study of innovation in manufactured goods, Abernathy and Utterback use a unit of analysis based on something they call 'the productive unit'. The productive unit is defined as "a product line and its associated production process" (p.43). In small firms the productive unit may include the whole company, but in a larger company it could be a manager and his or her operating division. In addition, some production processes will be sufficiently fragmented so that the productive unit spans several firms.

Recent trends in the study of innovation have suggested that 'production' is a too narrow focus for understanding the way in which new products appear on the market. Prior to the production process there is a development phase and before that a design phase. Following production there is marketing and distribution and withdrawal from the market.

Two trends are making this latter stage increasingly important. First, there is growing awareness of the need to time the release of new products as they are succeeded by new ones. This has become a key aspect of corporate strategy. This is particularly true in information technologies, where buyers are accustomed to frequent change and rapid obsolescence. No one wants to follow the example of Adam Osborn, who

announced that his next computer would be much better than the current model, and the company collapsed as buyers waited for the new one. The second trend is increased attention to the environmental impact of products, with the withdrawal phase often extended to include disposal or recycling efforts. Both of these trends suggest greater attention to a system life-cycle approach to products and production.

Related to the question of environmental concerns is the overall recognition that innovation has become an exceedingly complex process. As a result innovation is increasingly conducted in teams and to a growing extent the team members are drawn from all parts of an organization.

When considering innovation, therefore, it is important to recognize that the entire product/process is the unit of analysis and this could span multiple organizations. Whether formally recognized or not, innovation inevitably involves multiple disciplines and specialties. The term 'productive unit' will be used in this research to describe these groups: everything from a small team to several large corporations, depending on the scope of the innovation being contemplated.

Innovation occurs on many levels within organizations. Attention to product life cycles takes a longitudinal or 'horizontal' look at innovation for competitiveness. Such a view follows the productive unit over time or space. It is also possible to consider productive units in relation to other units. Prahalad and Hamel's work on core competence shows how they view competitiveness using a tree metaphor to focus attention on its many aspects: core competencies[18] are the roots of competitiveness, core products are the trunk while product lines and production processes are the major limbs and branches. At the ends of

the branches are end-product portfolio offerings -- the fruit and leaves of competitiveness. In this context the 'productive unit' would have to consider an innovation not so much in terms of where it comes from, and how it is made, distributed, sold and recycled, but how it relates to the intellectual strengths of the organization, base technologies, complementary products, strategic alliances, and so on. In other words, the context for production: the factors that, taken together, mean it makes sense for a company to provide a product or service.

Taking these two concepts together -- product/production process and (core competency) context -- allows greater precision in determining the unit of analysis. With these concepts as guideposts it becomes a matter of determining what makes sense in terms of process and context. For some new telecommunications services, the unit of analysis may be a wholly contained group within a particular division of an organization. In another context, or given a different product/production process, the unit of analysis may have to expand to include the equipment vendors or an information service provider. Examples of all three types are included in the case studies. What all have in common however, is a group for whom the process or the context made sense in terms of bringing an idea to market, making a technological innovation.

In some ways, the notion of a productive unit as the unit of analysis is even more apt for services than it was for manufactured goods. One of the defining characteristics of services, simultaneity (the service is produced and consumed at the same time), requires that we look at the product and the production process together when considering innovation.

Study one

Data collection for stage one began in the summer of 1991 and was completed in the summer of 1993. During this stage the author participated as an active member of an innovation team in a telecommunication services firm. The results of this participation are presented in Chapter Six. Data were collected in the form of observations, field notes, interviews, questionnaires, documents collected by the team, and documents, reports and presentations created by the team. As an active member of the team, the author was both a researcher and an innovator and contributions to research questions came from both experience as well as suggestions from other team members. The initial research question was: "can a technique for managing the very early stages of concept formulation in telecommunications products be 'ported' over to telecommunications services?" During the course of stage one data collection, additional research questions emerged on topics such as the relation of formulation techniques to general management, the impact of an activity like this on employee skills and morale, and the possibility of new concepts finding an unforeseen outlet within an organization.

Methodological Note: Participatory Action Research

Although the active aspect falls within the bounds of the case research strategy described in the first section, it is better understood as "action research" or "participatory action research". The researcher who chooses to become actively involved with his 'subjects' puts himself in a difficult but potentially rewarding situation. For management of technology research, which strives to be problem oriented

and deliver practical solutions, participatory action research is a particularly appropriate technique.

In most research, the investigator takes pains to stand outside the research environment. Involvement in the activity being investigated is seen as a potential source of bias in the results. Even ethnographers, who may live with a community and interact with the members of that community on many levels, are reluctant to actively participate in the subject of their inquiry. A few researchers, however, have begun to argue the virtues of what is now known as participatory action research (PAR).

One of the most familiar with the technique is William Foote Whyte, whose pioneering research on street corner society remains a classic text in field work (Whyte, 1943). Whyte's recent work, in rural development and organizational change (Whyte, 1982; Whyte & Alberti, 1976; Whyte, Hamilton, & Wiley., 1964), demonstrates the utility of an active role for the investigator. Recently, Whyte and others have taken the practice of participatory action research and worked on making it available as a research methodology (Whyte, 1989; Whyte, 1991; Whyte, Greenwood, & Lazes, 1989).

The chief outcome of researcher involvement, they argue, is the greater understanding that occurs due to mutual learning. In other words, the researcher can learn a great deal by moving beyond observation to participation. Part of that learning comes from learning by doing. An additional source is the insights gained from the other participants -- the subjects in a traditional context.

In the case of the exploratory research being conducted in this instance, the learning was appreciably enhanced by insights gained by being a participant and from the insights of my fellow team members.

When it comes to studying the innovation process, it is perhaps inevitable that one will become enmeshed in the process if one wishes to understand it thoroughly. As people search for new ideas and opportunities, they engage in a wide ranging search for information and an iterative process of self-examination and conversation. Ideas are brought forward and discussed, debated and rejected. It has been my experience that if one is present at these sessions it is almost impossible to avoid being drawn into a discussion. Team members are typically giving all of their attention to the problem at hand. Someone who is not participating is at best suspect and at worst in the way.

Details of data collection, study one

The author undertook to develop a better understanding of the innovation process for telecommunications services as part of a larger sponsored research project on the management of technology, innovation and change.[19] The opportunity to explore service innovation came when a telecommunications firm invited the research team to transfer a methodology used by the researchers to their organization. The methodology, known as "champions of innovation", is implemented by a team and emphasizes learning from extreme cases of technical and market innovation outside the firm.[20]

In order to make this transfer as effective as possible, the research team of Paul Guild and Richard Smith proposed that the organization create an innovation team and assign them a service formulation task. This provided the organization and the research team with an opportunity

to assess the applicability of the "champions" approach to a new company and a new product (telecommunications services). Previous applications had emphasized telecommunications equipment and had been implemented at a research lab specializing in telecommunications equipment (Bailetti & Guild, 1991b).

The author worked full time on the innovation team for eight months. He had two responsibilities. The first task was to facilitate the transfer of the technique to the team and the organization, so that by the end of the process the organization would be able to replicate the technique when and as they desired. The second task was to participate as a team member and provide additional resources as required to successfully complete their task.

Many different types of data were collected during stage one:

- A major proportion of the team's work was to collect information and produce reports or presentations. After the team was through with this material, it was retained by the author for later review.

- The team members were co-located for at least part of each week and the author was present as a full team member during those periods gaining insight into the day to day activities of an innovation team. These insights were collected in the form of field notes.

- After the team had collected information from its scan of the environment and created their first report, the author administered a questionnaire to the team members, asking them about their confidence in the technique and their ability to use it for new service formulation. Data from those questionnaires were tabulated and retained and, in the spirit of participatory action research, the results were shared with the team.

- The team made visits to external innovators, and the author traveled with the team and participated in question and answer sessions. Trip reports and field notes were maintained from those visits.

- When the team returned from their site visits they spent an intensive week "brainstorming[21]" on what they had learned. The results of that daily brainstorming, the data from idea generation and ranking, as well as discussion notes during the sessions were retained for use in the analysis.

- The team members prepared individual trip reports which were subsequently compiled into a overall report of their visits. These, along with additional background material on selected opportunities identified during the brainstorming, were retained for later analysis.

- Team members completed 'opportunity screening guides' for their top twenty service concepts and detailed pre-business plan analyses for the top three. These were created as part of a final presentation to management (first to the group of sponsoring managers and then to a larger group of interested managers). Both presentations as well as notes from the discussions following the presentation were used as data.

- Immediately following the final presentation, a group de-briefing was held with the team members and the author. The discussion notes were used as the basis for a questionnaire distributed to the team members by fax. The results were used as data in the case study.

- In the spring of 1992, approximately two months after the final presentation by the team, the author interviewed each team member in depth about the technique, the experience, and the team members recommendations for the future. An interview guide was used, the

interviews were video-taped and the transcript was used as data for the first case study.

- One year later, in the spring of 1993, the author re-interviewed the team members. The author took notes during the interviews and transcribed the notes immediately afterwards. These transcribed notes were used as data.

- Also during the spring of 1993 the author spoke with several managers who had been involved in the selection and sponsorship of the innovation team. Their impressions of the process, the team, and the results, were collected in telephone and in-person interviews and transcribed.

As an active participant in an innovation team from May 1991 to January 1992, the author was able to gather insight on the inner workings of innovation for telecommunications services. As an insider to both the service innovation team and an academic research team conducting sponsored research, the author had access to both the participating team members and the managers and executives responsible for the process.

One of the emergent theories from this dual participation was that difficulties in extracting value from the "champions" formulation technique stemmed more from the interaction between the team and management than from the technique or the team themselves. Another observation was that a great part of the value of this technique was indirect, in the form of employee training and empowerment achieved from participating in a team undertaking and being exposed to external information and innovators. Finally, because of the long period of elapsed time between first and last contact with the team, it became

apparent that team recommendations sometimes developed a 'life of their own' if they were not acted on by those who commissioned them. An alternative model of the formulation stage for innovation was developed and a second layer of data collection was initiated to explore these questions.

Study two

Data collection for stage two was completed in July and August of 1993. The author interviewed and collected documentary materials from 11 team members who had participated in innovation probes at an organization specializing in research for telecommunications equipment. This material is presented and discussed in Chapter 7 as the second case study.

Details of data collection, Study two

With the help of the originator of the champions of innovation technique, the author located and interviewed another group of innovation team members. Most of the interviews were with one team, which had explored an almost identical application area as the services team six months earlier. This group was selected to allow between case comparisons. Several individuals from other product teams were also interviewed in order to provide some 'within case' comparisons.

Data were collected during stage two included a survey, interviews and documentary materials:

- Team members were contacted by phone and by letter. An interview time of at least 30 minutes was requested. The interviews were conducted by telephone and detailed notes of the conversation were kept. The notes were immediately transcribed. A question list was used to guide the conversation.

- A survey, based on the survey completed by the services team during and after their team activity, was delivered to each team member by fax. The survey was pre-tested with the team leader during a telephone conversation and modified based on his comments. Team members returned the survey by fax or, in one case, by e-mail.

- Documentary materials relating to the innovation probes were collected from the team leaders. The documents included materials gathered by the team as well as material produced by the team.

The author was not a team member and did not collect this data in a participatory environment.

During this stage the author looked for evidence to refute or confirm a model of the early stages of the innovation process.[22] This model emphasized the relationship between the team and its environment. Based on the data collected in stage two, the model was revised from a descriptive model to a process model and data collection for the third study was initiated.

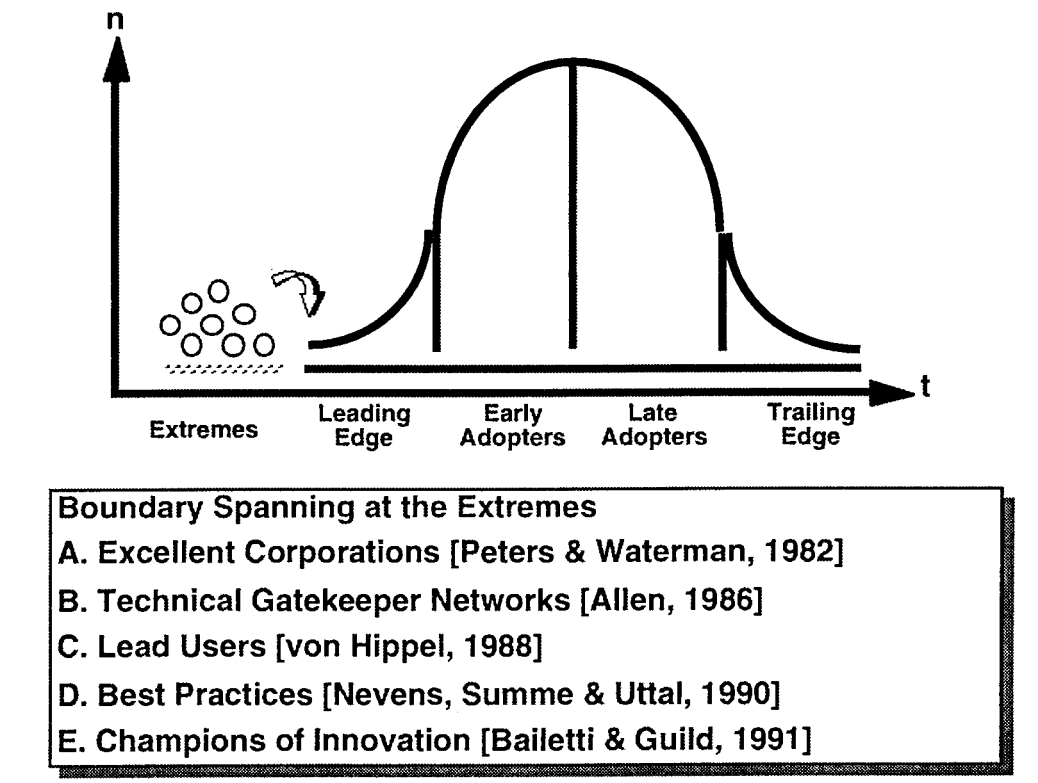
Study three

The third study used data collected from innovators at a telecommunications service provider, as well as at two telecommunications equipment providers. The telecommunications carrier (services)was chosen for this research because of its reputation as an innovative provider of telecommunications services. Several articles in trade journals in the previous months had featured interviews or profiles of the activities at this company. Groups at the equipment provider companies were identified during the course of interviews with the services innovators.

Methodological note: Learning from extreme cases

This study makes extensive use of non-representative sampling. Before getting into the merits of such a process, one might well ask -- "why bother?" Why search out unusual cases when it is possible to do representative sampling and thereby gain the power of accepted statistical analytic methods? The answer lies in the problem orientation of the research and the desire to do 'applied' science. In this research the question is not so much "what is being done?" -- a descriptive issue -- but "how could it be done better?" -- a prescriptive one. The stated objective, then, is to produce prescriptive results. This objective interacts with the nature of the problem, which is adapting to and identifying opportunities in circumstances of rapid change. If one seeks to benefit from change, one may not be able to learn enough from average or even better than average cases in a normal standard distribution. The 'adoption curve', described by Rogers, can help us understand this phenomenon better:

Figure 4.1: Adoption Curve



The "Y" axis of the graph represents number of organizations who ight offer insight on change. The "X" axis depicts time. If we are in ircumstances of rapid change there is little advantage to speaking to rdinary early adopters -- because they are only early adopters of xisting options. In order to learn about next generation products and ervices one is obliged to go further, to those people outside the range f a single standard-deviation in an innovation diffusion curve.

Such exploration, however, begs the question of how to treat the data ollected from these sources. Traditional statistical analyses assume andom sampling and are not appropriate. Fortunately, the overall trend

to legitimizing qualitative data provides the social scientist with a choice of several analytical tools appropriate in these circumstances. Some of these techniques, described in greater detail at the beginning of this chapter, are pattern matching, explanation building, and time series analysis. Additional modes of analysis include embedded units, repeated observations, and case surveys.[23]

Details of data collection for Study three

In order to obtain further evaluation of the formulation model, as well as explore service innovation in other contexts, an "exceptional" innovator within the Canadian telecommunications industry was sought. . Using the same techniques recommended for innovation team members by the "champions" process, the author scanned the relevant literature for examples of champions of innovation. One company stood out as just such an organization and their senior management was contacted by letter. The president recommended their strategic planning group as an appropriate contact for service innovation. Through that contact the company agreed to participate in the study. Two service innovation projects were identified and team members from each project were contacted by letter and then by telephone to arrange an interview. Interviews with were by telephone. Detailed notes were taken during the telephone conversation and these notes were transcribed immediately afterwards. A question guide was used to focus discussion.

During the course of the interviews it became clear that two of the equipment suppliers to the organization had been deeply involved in the innovation process. Additional interviews with employees of those organizations were conducted, again by telephone. Some documentary

materials were collected and database searches were used to create a profile of all three organizations.

The interviews revealed an interesting story of innovation between a telecommunications service provider and its equipment provider in the development of a new generation of telephone equipment. Additional interviews with employees from three organizations were conducted to complete this as a case study.

Once identified and contacted by letter and telephone call, a senior manager at the telecommunications services company agreed to identify two innovation teams that could provide insight into the formulation process in their organization. Data was collected from 11 team members during telephone interviews during September and October of 1993.

The two teams were roughly similar in size and the financial magnitude of their innovation decision, so within case comparisons were possible. They also operated in roughly similar circumstances as the teams in stage one and stage two, so some between case comparisons were possible. Both teams indicated that their new service concepts required interaction with a key equipment provider.

Data collection, Study four

The fourth study collected data from exceptional innovators in telecommunications-related businesses -- equipment and services -- and financial services. Information was collected by telephone interview as well as database search. The research involved fourteen respondents from ten financial services and product firms, and eighteen respondents from nine telecommunications services and products firms. Based on this research, one illustrative case study was selected for detailed treatment in the dissertation.

Details of data collection for study four

The champions selection technique was used to select respondents. Each was contacted by telephone or by mail and an interview time was established. After a series of interviews, one firm was selected for follow-up. Two site visits were conducted, interviews and documentary materials were collected, and additional information was gathered from follow-up phone calls and library research.

Limitations in the data

In the first study, the questions were largely exploratory and therefore the data were collected with a bias toward depth of understanding, with a resulting limitation of less breadth or generality. The data represent one organization in one sector of the economy. The ability to generalize is therefore strictly limited. The data are taken from a single innovation team within that organization and are necessarily influenced by the personalities and events that comprised that team's experience. Finally, the data in the first study were collected during a period of dramatic change in the organization and that is reflected in the findings to be discussed later.[27]

The second study combined some of the data collected in the first study with new data and comparisons were made between the two sets of data. This study was exploratory and therefore there are not a large number of replications to enhance generalizability. In the second study the author did not have participatory access to the team. Instead, interviews were completed by telephone. Example documents from several stages in the formulation process were also collected. Documentary evidence in this study is more like a sample than a complete record.

Moreover, the events in question took place two years prior to the interviews so the data are limited somewhat by the interviewees ability to recollect.[28]

The third study included four product formulation events in both the equipment and services aspects of telecommunications. The additional cases allow a greater degree of generalizability but of course do not provide the same depth of experience. The author did not have the same 'insider' position with the innovation teams in these cases, so there is the possibility that the respondents were not as frank in their responses.

The fourth study included a large number of responses and represents an attempt to build generalization within the telecommunications sector (both equipment and services) as well as an additional service sector, financial services. The quality of the data is limited in this study by the use of the interview format. Statistical analysis of the results were not possible.

All four studies used a form of sample selection which is based on exceptional or extreme cases (see "learning from extreme cases", above). In an area of human activity where there is a great deal of uncertainty as well as considerable failure or non-participation, this is an effective method of increasing our understanding and doing some exploratory research. However, it necessarily limits the use of many statistical analyses which assume random samples.

Endnotes

[1] See Mitchell (Mitchell, 1983) for details of the debate and the key participants.

[2] Note Whyte's critique of the distinction between 'pure' and 'applied' sociology in Whyte, 1991b.

[3] Stoecker makes a persuasive case that the proper response to calls for more objectivism in case studies is to identify these as misplaced attempts to impose one epistemological structure on another.

[4] One of the ways that quantitative social science attempts to control variables (since it is still the case that social actors cannot be controlled like chemical processes or laboratory rats) is through statistical controls. Once you have the numbers (through survey or observation) they can be subjected to a multiple regression analysis to impose controls afterwards. In case research, however, it is common to have more variables than data points, making that sort of statistical inference impossible. The implication from that, of course, is that a technique which can learn 'richly' from a limited numbers of units of analysis is what is required.

[5] Triangulation is the use of a combination of methodologies on the same phenomenon. One can be looking for convergence of agreement between methods in order to improve accuracy and reliability, or one can attempt to cross-validate or compensate for the weaknesses of one method with one that has counter-balancing strength. See Jick (1983) for more details.

[6] See Stoecker (1991) for a review of the literature here. Authors cited include Bromley, Kazdin, Campbell, McClintlock et al., Skocpol, George, Platt, Yin, and Berger.

[7] Kathleen Eisenhardt at Stanford and Rosabeth Moss-Kanter at Harvard Business Review are two examples of well-known researchers using case method.

[8] Another way of looking at the problem of replicability is to think of the use of hypotheses as 'experiments' within the case. Lee describes the 55 hypotheses put forward in Kanter's "Men and Women of the Corporation" as potential 'natural experiments' within a case study. The concept of 'degrees of freedom' can be associated with this process of testing multiple implications of a theory (Campbell 1975:181-182).

[9] Examples such as multiple cases, or dividing cases into sub-units have been attempted but these carry with them the danger of the quantitative methods that researchers are trying to get away from by choosing a qualitative technique: the cases become isolated and unconnected pieces of data (Stoecker 1991: 93).

[10] The quality of the reported cases is in some instances substandard, and it seems that some criticisms of the methodology are more properly criticism of the way the work was done.

[11] Mitchell (1983) describes the two concepts this way: "Statistical inference is the process by which the analyst draws conclusions about the existence of two or more characteristics in some wider population from some sample of that population to which the observer has access. Scientific or causal -- or perhaps more appropriately -- logical inference, is the process by which the analyst draws conclusions about the essential linkage between two or more characteristics in terms of some systematic explanatory schema -- some set of theoretical propositions." Yin makes this same point, although somewhat differently. He accepts that there is such a thing a 'statistical generalization' (essentially rolling the statistical inference and the logical inference together) but argues that it is quite different from 'analytical generalization' typically used by the case researcher.

[12] Yin (1989), while he notes the 'suitability' of case research for 'how' and 'why' questions, does not take this to the next step to form a critique of the use of statistics in causal explanations.

[13] See Stoecker, (1991:95-96).

[14] It is, of course, not without its offsetting benefits, as I hope the discussion of 'responses to the critics' made clear. Multiple methods may be hard to do but it adds immeasurably to the results.

[15] Adapted from Yin's (1989) list ways in which case research was used in evaluation research.

[16] Sheth and Ram list four distinct forces responsible for the increasing importance of innovation to corporate management: changing customers, technological breakthroughs, new competition, and changing regulation.

[17] Porter lists five 'competitive forces that determine industry competition': threat of new entrants, bargaining power of suppliers, rivalry among competitors, bargaining power of buyers, and threat of substitute products. If we compare this list to Sheth and Ram's, there are several parallels. Bargaining power of suppliers and threat of substitute products as competitive forces relates to the innovation pressure from new technologies. Bargaining power of buyers relates to changes in customers. Threat of new entrants of often associated with regulatory change, especially deregulation. Rivalry among competitors is equivalent to the "new competition" described in Sheth and Ram.

[18] Core competence is defined as a base skill or a combination of base skills that on its own or when arranged in a core product is critical to attaining sustainable competitive advantage in a broad range of end products. Core competences are the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies (Prahalad & Hamel, 1990).

[19] A description of the research project funded by two national academic granting councils, two telecommunications companies and two universities is included as an appendix to this thesis. The principal investigator for that research, Dr. Paul Guild, was the author's supervisor.

[20] For a full description of the "champions" method, see chapter five.

[21] Alex Osborne is credited as the originator of this type of creative problem solving. See his book, *Applied Imagination* (Osborn, 1963). The word brainstorming has entered the public vocabulary as a generic term for this sort of activity. The essentials of brainstorming are limited to a few guidelines to avoid pitfalls: delay judgment and strive for a large number of ideas. Two additional refinements have been added to the brainstorming practice in recent years. Roger Von Oech (Von Oech, 1990) points to the value of having four "modes of thought" during a brainstorming session. These are identified as Explorer (gather as much information as possible), Artist (genarate as many "wild ideas" as possible to solve the problem), Judge (evaluate the ideas, don't throw any out until the usefulness is extracted from them), Warrior (execute the solution, follow through on the problem solution). These different ways of thinking imply different people, usually. Kathy Kolbe's book *Pure Instinct* (Kolbe, 1993) describes four types of "modus operandi" that are essential in a good team but are not sufficient in and of themselves. For example, a team full of "bright idea people" will never follow through. A team full of "fact finders" won't decide until the last data is in. One containing only "follow through" types will never generate the ideas. Kolbe identifies how R&D teams fail due to these types of inadequate mixes.

One issue that is seldom considered by these "problem solving" approaches is what happens if the problem itself is not clearly understood. Funtowicz and Ravetz's typology of uncertainly, ranging from technical to epistemological, comes into play here (Funtowicz & Ravet, 1989). "Technological uncertainty is based on disputes over accuracy or precision of observations and measurements. Methodological uncertainty derives from concern about whether the right analytical tools are being applied.…epistemological uncertainty is the state of concern about whether we even have the right conception of a phenomenon or a problem" (O'Riordan & Rayner, 1991).

Types of uncertainty and styles of problem solving

Type of uncertainty	**Conditions for decision making**	**Prerequisite for authority**	**Source of authority**	**Problem-solving style**
Technical	Risk	Information	Instruction	Reductionist
Methodological	Uncertainty	Respect	Experience	Pragmatic
Epistemological	Indeterminacy	Faith	Revelation	Holistic

These distinctions were created in the context of decision-making about environmental risk but they can be usefully applied to innovation. For example, we might, as O'Riordan and Rayner did, speculate on the type of organization best suited to dealing with certain kinds of uncertainty.

Their conclusion was that a hierarchical institution preferred to deal with technical risk, an entrepreneurial organization might prefer to approach uncertainty as a methodological issue, while egalitarian collectives "may be more comfortable recognizing conceptual uncertainties than hierarchies or markets." This, in turn, can lend insight into the type of innovative team we require to solve certain kinds of problems.

The table above also suggests the types of responses a team can expect, depending on the type of uncertainty they set out to resolve and the type of institution they are working within. In the case of a team in a large, hierarchically managed telecommunications organization, insights that were based on experience and require respect as a prerequisite for authority are less likely to be approved than those based on instruction and requiring information as a prerequisite for authority.

[22] See the discussion in Chapter six. Note that for the purposes of this research the word "model" is used to denote a simplified or abstracted version of reality. No attempt was made to reduce variables to numerically assigned values or relationships to formulae.

[23] Yin (Yin, 1989) refers to these three as "lesser" modes of analysis, meaning they should be used in conjunction with the first three.

[24] Numerous introductory texts on the Internet are available, both in bookstores and via the Internet. Adam Engst's *The Internet Starter Kit for Macintosh* is both a typical and useful example of such a book (Engst, 1993).

[25] Alex Black (Department of Communication, Canada) and Mac Parks (University of Washington) are working on a project about the ethics of doing social science research on Usenet and Internet. Their research questions and other background material are available via a gopher server maintained by Industry Canada. An URL for this material is:

<a href=gopher://debra.dbgt.doc.ca/Usenet-survey><a/>

[26] The rapid growth in the user population on the Internet has resulted in a perhaps inevitable reaction to the increase in concern over naive questions being raised in specialized discussion groups. These concerns periodically explode into fierce discussions of what is appropriate behaviour on the network.

[27] Rapid organizational change may in fact reflect the norm in the current economy.

[28] The passage of time was beneficial in other respects, since some of the questions were related to the outcomes of formulation team recommendations. In both cases sufficient time had passed that the outcome (or lack of outcomes) was well known to all participants.

Chapter Five

Methods for Formulation

This chapter examines "formulation" techniques from the management of technology literature.[1] Jeffry Timmons' book on entrepreneurship (Timmons, 1990) describes the process of *formulating* a new business concept as: "activities performed to recognize, shape and evaluate the information necessary for defining opportunities for new products which are both desirable to, and attainable by, the business unit".[2] Firms have a strong incentive to manage this process well, particularly by increasing the quality of the decisions which arise from opportunities that have been identified and reducing the time it takes to make them. The first part of this chapter reviews some recent techniques which have been utilized to do this. The second part describes the use of a related technique in formulating new business concepts for a large telecommunications services organization in Canada. The third part draws out some themes, both from participating in that formulation process and through interviews with other participants and interviews with innovators at other telecommunications service organizations, with an eye to creating a revised model of the formulation process.

Formulation techniques

Formulation of business concepts is an innovation problem. The importance of innovation as a response to competition has been discussed in Chapter Two. Here the details of a formulation process -- which seeks to merge ideas (inventions, technical or otherwise) with markets -- is examined in detail.

Innovation and formulation -- where does it fit?

For mass consumption products and services, innovation may be thought to span a continuum, the extremes of which consist of large and small changes on three dimensions -- market, technology, and mode of production/consumption. Some authors have shown that small, or *incremental* innovations comprise the bulk of additional profit and income for companies (Abernathy & Clark, 1985). Other authors have pointed out the importance of discontinuities (Foster, 1986) or *radical* innovation when considering changes to the competitive structure of an industry or an economy (Morone, 1993). In between these extremes are so-called *architectural* (Henderson & Clark, 1990) or significant changes.

There are several reasons why it seems most sensible to concentrate new techniques for formulation on activities which are related to significant change on at least one of the three dimensions described above. In the case of incremental innovation, directions of change are well known to all participants and established methods for making change are probably sufficient. Little additional benefit is gained by going to extraordinary lengths to come up with concepts. Moreover, the position of a firm or organization relative to its customers or its competitors is rarely influenced by the quality or timeliness of incremental change concepts. It is the execution of incremental changes that is a more significant influence on results.

Radical change is likewise a poor candidate for revisions to the formulation process, although for different reasons. In the case of a radical breakthrough there is little to be gained -- and in fact much to be lost -- by rushing the process. Although many studies confirm the importance of efficient R&D management and the impact of breakthroughs,

all agree that there is little we can do to force an invention. In addition, the often lengthy time lag between invention and marketability of that invention and the unpredictability of who will eventually be able to capitalize on the results suggests that faster or better formulation is not a priority for these sorts of activities. In the more extreme kinds of radical change these are easier to notice and there is time to adjust and anticipate.[3]

For the so-called significant or architectural changes, however, attention to formulation activities seems like a promising alternative. Here the competitive benefits of change are easier to capture and protect and they are not so obvious that others will already know what you are going to do.

Formulation techniques -- how to do it?

The fact that these changes are not obvious calls attention to the tools and techniques used to "recognize, shape and evaluate … information". Particularly in fields were changes are rapid and/or highly technical, traditional market research has been found lacking as a source of significant new product concepts (Paré, 1993).

One of the most promising directions for insight into new products in recent years has been the movement away from average feedback and an emphasis on exceptional information even though the norm in market research is to use sampling to identify and characterize the typical consumer.

It has long been known that for the purposes of research it is possible to 'sample' a population and still achieve meaningful and useful results with only a relative handful of people standing in for the entire group in question. The phenomenon is most familiar to us in

the form of political polling that precedes an election. In Canada, as few as 1000 people are thought to be sufficient to accurately estimate the opinions of millions of citizens across the country. The crucial element in these types of surveys is to have a representative random sample -- that the profile of the people sampled is similar to the profile of the population as a whole. Considerable statistical research has established guidelines for achieving this result. Marketing research has for years built upon that research to create sophisticated mechanisms to deliver representative groups for whatever market or buying pattern could be thought of.

The result of all this effort are very accurate techniques for establishing the opinions and ideas of the average consumer -- even in a sophisticated area such as scientific instruments or telephone switches. When considering methods for formulating new business concepts, especially for significantly different products and services, there are at least two drawbacks to this approach. The first is the 'snapshot' picture that much survey research provides. While it is useful for a view on what is going on *now* it is less insightful when making prediction of change. A political poll taken early in a campaign might have limited value by the time ballots are cast. This difficulty can be addressed by getting closer to the sample through focus group or interview research. The more fundamental problem lies in the limited ability of people to anticipate the future and make meaningful comments about their future needs. The problem is that "users selected to provide input data to consumer and industrial market analysis have an important limitation: Their insights are constrained by their real-world experience. Users steeped in the present are, thus, unlikely to generate

novel product concepts that conflict with the familiar." (von Hippel, 1988: 102)[4] This emphasis on the here and now would not be a problem were it not for the rapid pace of change. In a slow-moving world, even the 'new' is familiar and typical users can make useful contributions. In a faster paced world, however, "the related real-world experience of ordinary users is often rendered obsolete by the time a product is developed or during the time of its projected commercial lifetime." (von Hippel, 1988: 107). If the ordinary user is not a help, where can we look for help in new concept formulation?

Lead users

Eric von Hippel and Glen Urban of MIT have done considerable work on the *sources* of innovation (von Hippel, 1985; von Hippel, 1986; von Hippel, 1988) and one of their most interesting findings has been the important role of 'lead users.' A lead user of a novel or enhanced product, process, or service is defined by von Hippel as one who displays the following two characteristics:

1. Lead users face needs that will be general in a marketplace, but they face them months or years before the bulk of that marketplace encounters them, *and*
2. Lead users are positioned to benefit significantly by obtaining a solution to those needs. (von Hippel, 1988: 107)

von Hippel suggests a four-step process for incorporating such users into market research and product development efforts.

1. Identify an important market or technical trend;
2. Identify lead users who lead that trend in terms of experience and intensity of need;
3. Analyze lead user need data -- generate product/service concept with lead users;
4. Test concept with the expected customer population.

Urban and von Hippel's test of the lead user process in the field of computer-aided design of printed circuit boards (PC-CAD) was positive: "New product concepts generated on the basis of lead user data were

found to be strongly preferred by a representative sample of PC-CAD users" (Urban & von Hippel, 1988).

Students of communication theory will recognize the 'lead user' as an 'early adopter' from Rogers' and Shoemaker's research on the diffusion of innovations (Rogers, 1983; Rogers & Shoemaker, 1971). In fact it is the pioneering work of Rogers and other diffusion researchers that lays the groundwork for the lead user method. The existence of lead users can be attributed to the fact that new 'technologies, products, tastes, and other factors related to new product opportunities' generally diffuse through a society, often over many years, rather than influence all members simultaneously (Mansfield, 1968).

For many people trained in statistical methods, a focus on exceptional -- as opposed to typical -- respondents seems like a violation of the rules of sampling. And, if we were proposing that this was a representative sample and could be used to make conclusions about the population as a whole, we *would* be violating those rules.[5] In this case, however, the results will be used to make predictions about the future, and not statements about the present, something better handled by "normal" market research.

Urban and von Hippel implemented their lead user method in a four step process. The first step is to identify 'an important market or technical trend', the second is to 'identify lead users with respect to that trend', the third is to analyze lead user data, and the fourth is to test lead user data on ordinary users.

If lead users are assumed to be 'out in front' of a trend, it is essential that a trend be identified before starting the research. von Hippel and Glen Urban typically use expert interviews to determine a

trend. Using the definition described above, two measures are used to identify lead users. First, people who are participating in the trend as identified and secondly, those who stand to benefit greatly from the continuation of that trend. The two researchers created a formal, objective measure of the trend and benefits and used a telephone questionnaire to extract information from participating lead and 'non-lead' users. The third stage is to analyze the insights gained from lead users. A sub-set of the telephone interviewees participated in group discussions with the specific task of designing a better version of the systems they used at present. The last step is to test the lead user group's suggestions with the general market -- in this case the entire sample of firms contacted for the screening questionnaire in step two.

A test of the lead user method was published by Urban and von Hippel in 1988 (Urban & von Hippel, 1988). In their review of the results of that case, the authors describe the results as "very encouraging." According to the authors: "Lead users with the hypothesized characteristics were clearly identified; a novel product concept was created based on lead user insights *and* problem-solving activities…;and the lead user concept was judged superior to currently available alternatives by a separate sample of lead and non-lead users" (Urban & von Hippel, 1988:579).

They based this positive assessment not only on the actual results but on the fact that the lead user methodology is a "logically straightforward combination of three components, and each of these *components* has been empirically tested in other contexts" (Urban & von Hippel, 1988: 579). The components have been discussed above -- the importance of experience in problem-solving as described in a series of

papers from the 1940s and 1950s (see von Hippel 1986 for a summary of these), the tendency for people to experience a need before others and lead with respect to a trend (Rogers, 1962; Rogers & Shoemaker, 1971), and finally, Mansfield's finding that the effort users exert to solve a problem differs according to the amount of need they have for the solution (Mansfield, 1968).

Eric von Hippel has used the lead user method many times since and in addition to several papers published on various aspects of it, he maintains an active consulting business helping companies conduct new concept development with this technique. Bailetti and Guild, through a corporate association with MIT as well as personal contact between academic and professional researchers at both institutions, became interested in and implemented the 'lead user' technique in the 1980s.

Bailetti and Guild's organization faced rapid change in the mid 1980s. As senior project managers, Bailetti and Guild traveled to Boston to speak to von Hippel and learn more about his lead user method. In addition to rapid change in their industry, senior managers at the company had begun to recognize that their new product development process, while improving in its later stages through the use of technology such as computer aided design and concurrent engineering, was taking too long in the early stages. There were two disturbing aspects of the length of time. First, it appeared to be getting longer -- not just in relative terms but absolute terms as new product formulation took on new importance -- when a product is in the market for such a short time there is very little opportunity to either revise it or extract value from a marginally competitive design by leaving it on the

market longer. Second, the organization did not have in place any plan, method, or technique for reducing this time.

The response was a rapid search for techniques which could assist in the formulation process and the "lead user" technique suggested by von Hippel appeared very promising. However, a further complication in the Bailetti and Guild's situation resulted in significant revision to the lead user technique. These changes were sufficiently important that management scientists argued, successfully, that they coin a new term for their technique when presenting it for publication. The name they chose was 'champions of innovation."

Champions of innovation.

The complication referred to above was the extent to which firms, operating in an environment of extremely rapid technical change, come to rely on in-house 'designers' to provide operational definitions of opportunities for innovative products. There are good reasons to rely on designers -- they are felt to be the primary access point for new technical knowledge for the firm (Allen, 1977) and provide a place where "boundary spanning" (Tushman, 1977) takes place, an increasingly important activity as developments come from the intersections of fields and knowledge. Designers have strong opinions, however, and they frequently resist ideas proposed by marketing and consumer research. This is especially the case when dealing with new concepts, a notoriously difficult area in which to conduct market research, as previously stated. Designers are focused on the internal (technical) solutions to problems as opposed to market and technology trends emerging outside the firm. For this reason they need contact with leading users and technology suppliers.

According to Ed McCracken of Silicon Graphics, a computer workstation maker:

> A company can't use traditional market research to pick up on paradigm shifts. Its best technologists, its most creative R&D people, must be out there to see or sense firsthand what its most creative customers -- what we call our "lighthouse" customer -- might want in the future. These technologists aren't getting customer input on the current product line; they're getting some feeling about how they might define a brand-new product that would do things differently. A company can't accomplish this very well with marketing or sales people. Such innovation requires engineers talking to customers. (McCracken, 1993)

Bailetti and Guild decided to involve their designers more directly in the process. Rather than conducting the lead user research separately and presenting the results to designers or design management, Bailetti and Guild decided to have the designers participate in the research process themselves. In making this decision they were partly influenced by the research on 'boundary spanning' and 'technical gatekeepers' described above. As Katz et. al., point out, gatekeepers are suited to non-complex information transfer but "given very complex problems to solve, the more effective innovation was associated with widespread face to face communication between members in the research group as well as with others outside the group" (Katz & Tushman, 1979). Cohen and Levinthal's work on 'absorptive capacity' (Cohen & Levinthal, 1990) is also pertinent here. The concepts of 'technical gatekeepers' (Allen, 1977) and 'boundary spanning' (Tushman, 1977) describe how individuals can assist in the innovation process by serving as transit points for information, but information movement still faces problems:

> A difficulty may emerge under conditions of rapid and uncertain technical change, however, when this interface function is centralized. When information flows are somewhat random and it is not clear where in the firm or sub-unit a piece of outside knowledge is best applied, a centralized gatekeeper may not provide an effective link to the environment. Under such circumstances, it is best for the organization to expose a fairly broad range of prospective

> "receptors" to the environment. (Cohen & Levinthal, 1990: 132)

One of the ways to 'expose a broad range of receptors' is to use a team when gathering outside information. If the team is made up of the designers who are responsible for operationalizing the new product concept, then another barrier to rapid innovation can be overcome. The team members' experience will help them exceed their "action threshold" (Van de Ven, 1986) and provide them with the confidence in the results that will spur them to convince senior management and their peers of the best course of action.

Bailetti and Guild gradually modified their process from a direct implementation of 'lead user' technique, with its emphasis on researcher-driven problem solving, to the team-driven process. The people they sought out were much like the "lighthouse" customers Silicon Graphics watches. Bailetti and Guild called them "champions of innovation". The teams at their organization typically numbered between six and ten core members with additional technical experts drawn in as required. Choice of team members emphasized multidisciplinarity, in recognition of the broad scope of potential opportunities.

Although von Hippel had utilized an interview method with his lead users, the interviews were typically between the lead user and the researcher. Even later on in his process, when groups of lead users were assembled for a discussion, this was done in the presence of the researcher and not a representative from an innovating organization. Bailetti and Guild, on the other hand, quickly determined that direct contact with external innovators was desirable since it avoided a filter and a summary step.

The multidisciplinary nature of the team and the lack of filters was particularly important at this stage because the team was expected to identify underlying trends themselves, in contrast to von Hippel's approach which relied on expert assessment to select a single trend[6] for study. As Bailetti and Guild point out, "the multidisciplinary team used input from champions of innovation to *gain* insights on potentially relevant trends, stepping stones toward innovative product concepts" (Bailetti & Guild, 1991b).

In order to distinguish this technique from von Hippel's Bailetti and Guild began to refer to the external contacts, and the method itself, as "champions of innovation."

The external contacts were selected in two stages, according to the following criteria:

> At the first stage, innovative solutions to leading edge needs were identified according to the following criteria:
>
> - the adoption of the innovative solution had been newsworthy during the last six months or known via the designer grapevine to have occurred in this time-frame;
> - the innovative solution addressed a leading edge need judged by the team to be within an opportunity area of interest;
> - the firm adopting the innovative solution had made a significant financial contribution to its development;
> - the team had reason to believe that the need addressed by the innovative solution would be general in the marketplace within the next five years.
>
> At the second stage, for each innovative solution selected by the team as being of interest, the champion of innovation was identified as the individual (or small group of individuals) who
>
> - most strongly believed in the need for, and the potential of investing in a particular solution to satisfy a leading edge need of the firm;
> - made the case for the firm's commitment to the solution;
> - frequently interacted with the firm's customers as a result of adopting the innovative solution. (Bailetti & Guild, 1991b)

Once the champions were identified, and the team met them and absorbed as much new information as possible, they then attempted to create operational definitions for new product concepts. This whole process can be thought of as a method to capture, shape and evaluate insight as generated by a team in the context of their environment. In their 1991 paper for R&D Management, Bailetti and Guild describe the method as composed of "seven sequential stages of information synthesis" carried out in four steps. The four steps are: (1) Define opportunity areas, (2) Identify sites to visit, (3) Discover and capture insights, and (4) Formulation of opportunities for new products. Within these steps are seven stages of information synthesis:

- Search for Innovations
- Direct Contact with Outside Sources of Knowledge
- Collection of Trip Reports
- Abstract of Trip Reports
- High Level Synthesis
- New Product Opportunities
- The Coalescence Session

Bailetti and Guild further distinguish their approach from von Hippel's by noting that while the lead user method seeks to manage data that in terms of quality is no different than that generated by traditional market research (*e.g.*, survey, focus group),. Champions of innovation, generates and deals with richer data:

> Our modified method deals with (1) the "quality" of the insights which result when designers, market researchers and product managers enjoy direct contact with individuals championing innovations in end-user firms, (2) the "quality" of the representation of these insights, and (3) the "quality" of the information reduction which takes place when shaping and evaluating new product opportunities (Bailetti & Guild, 1991b).

The 'champions' method, then, differs from the 'lead user' method in that it does not presume a pre-defined trend although it does not leave

this entirely open, either -- an area of focus is chosen instead. Instead of method experts, teams composed of technical specialists from multiple fields are used to gather and interpret the data.

As with Urban and von Hippel's work, Bailetti and Guild's report on their results with the use of the 'champions of innovation technique compares it with traditional market research, in this case focus groups and 'application probes.'[7] The authors note seven differences between this type of research and 'other market research approaches.'

> First, the method elicited greater acceptance from the design community, generally because designers had more of a sense of ownership of the results than they had had when opportunities had been identified through focus groups and application probes. Second, the level of understanding of the external environment increased significantly due to the greater attention placed on boundary spanning activities, the development of a wider permeable boundary between members of the team and champions of innovation as well as better communication among relevant stakeholders: namely marketing, R&D, and product management. Third, the number of potential sources for novel insights into new business, product and technology opportunities was greater due to the direct contact with champions of innovation by a larger number of team members with different skills and experiences. Fourth, the quality of information to support the operational definitions of opportunities, as well as the clarity of these definitions, was greater due to a better understanding of the relevant trends and improved account of both knowledge and ignorance. Fifth, more opportunities in a broader product/market area were generated and evaluated due to the larger amount of information gathered. Sixth, the method presented new challenges to implementation given that a key factor of success relies on the management of the integration of heterogeneous and widely disseminated information and the shaping of team opinions. Seventh, the method required a greater degree of executive involvement at an earlier stage given the substantial time investment of the design team required to implement it (Bailetti & Guild, 1991b).

The last two differences, challenges to implementation and greater executive involvement proved to be crucial factors in the next implementation of the technique outside of the organizations Bailetti and Guild had worked with in the past. Overall, the champions of

innovation technique proved to be a valuable one and it continues to be used in various forms without researcher intervention.

The origins of this technique have been described elsewhere (Bailetti & Guild, 1991a; Bailetti & Guild, 1991b). What began as an in-house attempt to use von Hippel's "lead user" techniques at a large telecommunications research firm gradually evolved into a practical innovation technique in its own right.

The technique is based on two fundamental principles. First, that the current competitive capabilities of an organization as well as its ability to renew and enhance those capabilities (Stalk, et al., 1992) is rooted in the *core competence* of the firm (Prahalad & Hamel, 1990). Core competence refers to the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies. Thus core competences are not "hard" technologies but rather *skill sets*. Table 5.1, below, sets out some of the main features of core competence and the related concepts "core design concept" and "core product".

Table 5.1: Core Competence Defined

Core Design Concept:	The trajectory of the design concept that conforms to core product(s). (Inferred from Clark, 1985)
Core Product:	A core product is a physical combination of one or more core competences. Core product is the platform from which the end products are delivered. It defines a long term program of technological change for introducing waves of new end products profitably and rapidly. (Inferred from Prahalad and Hamel, 1990; by Bailetti and Guild)
Core Competence:	A base skill or a combination of base skills that on its own or when arranged in a core product is critical to attaining sustainable competitive advantage in a broad range of end products. Core competences are the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies. (Inferred from Prahalad and Hamel, 1990; by Bailetti and Guild)

The notion of core competence is also found in James Brian Quinn's work. In his book *Intelligent Enterprise*, Quinn notes how he and Penny Paquette published a paper in 1990 that "both anticipated and went somewhat beyond that in C. Prahalad and G. Hamel …in terms of implications for strategy, outsourcing, financial, and organization structures" (Quinn, 1992:31).

Building on this first principle, the second principle that underlies the development and use of champions of innovation states that the *absorptive capacity* of the people in the firm is the basis for the improvement and growth of skill sets (Cohen & Levinthal, 1990). As a result, champions of innovation devotes attention in two directions -- first, collecting a *team* from a broad spectrum of functional areas with members who have breadth as well as depth of skills (sometimes called "keyhole" people (Curry, 1992)) and enhancing and exploiting that absorptive capacity by divergence (exposing the team to an enormous

breadth of information) and convergence (forcing the team to reduce their learning to shared convictions). This is done in a repeatable, structured way in order to reduce the time expended and the uncertainty of the team's conclusions.

Boundary spanning and technical gatekeepers

A range of techniques aimed at accelerating the product innovation process. The activities include obtaining information, resources, and support from others, using that information to create a viable product, and finally transferring the technology and enthusiasm for the product to those who will bring it to market (Ancona & Caldwell, 1990).

Boundary spanning is a term introduced into the literature in 1977 by Tushman. Another work from the same period is Allen's discussion of the role of technical gatekeepers. For both of these authors the flow of information into a research and development laboratory was felt to be a source of considerable variation in the way those labs performed. The emphasis was largely on engineers and research scientists working on innovative new products. Technical gatekeepers were identified as one of the ways information could flow into and out of a group such as this.

Allen introduced the concept of "technical gatekeeper", Tushman introduced the concept of "boundary spanning" -- when the expertise of most individuals within the organization differs considerably from that of external actors who can provide useful information, some members of the group are likely to assume relatively centralized "gatekeeping" or "boundary spanning" roles. See also Tushman (1977).

Allen (1977) (Allen, 1977)and Tushman (1977)(Tushman, 1977) introduced gatekeepers and boundary spanning, but there can be problems, as Cohen and Levinthal point out:

> A difficulty may emerge under conditions of rapid and uncertain technical change, however, when this interface function is centralized. When information flows are somewhat random and it is not clear where in the firm or sub-unit a piece of outside knowledge is best applied, a centralized gatekeeper may not provide an effective link to the environment. Under such circumstances, it is best for the organization to expose a fairly broad range of prospective "receptors" to the environment (Cohen & Levinthal, 1990:132)

"Exposing a fairly broad range of receptors to the environment" is not the usual practice among firms. Cohen and Levinthal suggest that in order to take advantage of such an objective, an organization would exhibit the organic structure of Burns and Stalker (1961:6) (Burns & Stalker, 1961)which is more adaptable "When problems and requirements for action arise which cannot be broken down and distributed among specialist roles within a clearly defined hierarchy"[8]

As we will see in our research, these 'organic' forms of organization (now most commonly referred to as a flat or non-hierarchical structure) are critical in the economic conditions prevailing at present. The problems are further accentuated when the rapid change is not merely in technology but in markets and business practices as well.

Ancona and Caldwell (1990) (Ancona & Caldwell, 1990)note what several other authors (Ancona & Caldwell, 1987; Burgelman, 1983; Quinn & Mueller, 1963) have also pointed out, that "to be successful, new product teams must obtain information, resources, and support from others, both inside and outside of the organization, use that information to create a viable product, and finally transfer the technology and enthusiasm for the product to those who will bring it to market" (Ancona & Caldwell, 1990:120). This position makes new product teams highly dependent on others, Ancona and Caldwell argue.

The early research by Allen (1977) and Tushman (1977)(Tushman, 1977) described a two-stage process whereby technical information is brought into a group. The review of the environment and dynamics of the globalized competitive economy in Chapter two suggests that much more than technical information is required in order to make accurate estimations of desirable features for new products and services. This broader range of external information is complemented by significant demands in terms of internal information as well. A more complete set of boundary activities can be taken from Adams (Adams, 1980): "acquisition of organizational inputs, disposal of outputs, searching for and collecting information, representing the organization to outsiders, and buffering it from external threat and pressure."[9]

Absorptive Capacity

If innovating is creating new techniques that can be marketed successfully, then a crucial element in this process is acquiring the new knowledge necessary to make that innovation. This could be knowledge about the market, about the technology, about the company itself, or about competitors. Cohen and Levinthal's paper on 'absorptive capacity' offers us some insights on how a firm can best make use of available knowledge, and why it might fail to make use of that knowledge. Cohen and Levinthal's thesis is that a firm's ability to profitably introduce innovative new products is largely determined by its capacity to recognize the value of new external information, assimilate it, and apply it to commercial ends.

Absorptive capacity can be thought of as the receiving circuits in a radio. No matter how well tuned, an AM radio will not be able to receive FM signals. A firm without the necessary skills (receptors of

information) will not be able to make sense of or act upon information even if it is collected or received.

An additional reason to be concerned with absorptive capacity is the environment which ensues, once a pattern of rapid innovation emerges in an industry. Under conditions of rapid change there is uncertainty about the knowledge domains from which useful information may emerge. In other words, it is hard to tell where the good indicators will come from, so it is important to build up an organizational culture that is receptive to information from diverse sources. In these circumstances the absorptive capacity of the firm must be 'tuned' to a very wide spectrum of reception.

Another reason to maintain a wide 'spread' of attention is the growing variety of products and the complexity and variety of the technology embodied in them. Linden alerts us to this process with his comment on the 'significantly increased dispersion of technology' in the current environment:

> This trend arises from the increasing complexity of new products, which depend on an ever-wider range of technologies; the growing number of high-technology startups and the expansion of university, industrial and federal laboratories, and the globalization of all these sources of new technology, which is most apparent in the increasing sophistication of the research establishments in Japan and Europe. Businesses must be more alert than ever to R&D conducted by others. In the past, U.S. corporations have tended to adopt an agricultural stance toward new technology, growing whatever they needed. Now they must learn to be better hunter-gatherers (Linden, 1992:61).

In order to better understand absorptive capacity, Cohen and Levinthal look at: individual absorptive capacity versus that of the firm, absorptive capacity as a function of the firm's prior related knowledge, and factors influencing absorptive capacity of the firm.

A firm's absorptive capacity depends upon the absorptive capacity of its individuals, but the sum total of the individual's absorptive capacity does not equal that of the firm. Absorptive capacity in a firm also depends on the transfer of knowledge across and within sub-units. Absorptive capacity is not easily bought; some knowledge is firm specific; other technological knowledge requires existing competent staff familiar with the firm's internal procedures and external relationships.

Cohen and Levinthal note that "prior knowledge permits assimilation and exploitation of new knowledge." Accumulating absorptive capacity in one period permits more efficient accumulation in the next. The presence of related knowledge will permit the firm to evaluate the importance of technological advances. 'Lockout' may occur if a firm stops investing in absorptive capacity especially in rapidly advancing fields. Organizations with higher levels of absorptive capacity tend to be proactive while those with lower levels tend to be reactive. Ironically, firms may not invest in absorptive capacity if they don't have the absorptive capacity to properly value it.

In a product concept, one of the best sources of process innovations is the production workers themselves. Porter's discussion of the German printing industry suggests that a major factor in the continuing success of German printing firms is the high level of training among print machinery workers and printing plant personnel. A key concern for service formulation is that the personnel creating the product front-line personnel and considerably less training is invested in them. They may not have the absorptive capacity to recognize innovative ideas when they see them.

Teamwork is desirable in this context because of the complexity of information and interconnectedness of effects that must be considered when contemplating a significant change in today's global economy.[10] Several authors have reported on the use of teams to improve coordination within the organization (Hackman & Walton, 1986; Kanter, 1983; Kazanjian & Drazin, 1986). A comprehensive response to multi-faceted problems or opportunity areas demands a coordinated approach. As Van de Ven notes, teams are also identified as a way to speed up the process by implementing parallel development streams (Van de Ven, 1986). Thamhain reported recently on a variety of authors', including his own, experience using teams in new product development. While the principles of team participation appear to have been widely diffused, and nominal usage of teams is widespread and growing, Thamhain reports that the effectiveness of these teams is not what it could be. The concept is sound, he argues, but the execution has not been satisfactory. Anne Donnellon describes research on four companies using teams for new product development and reports that the change process that teams initiate seems to falter in the extent to which organizations are unable to change in order to accommodate teams (Donnellon, 1993).

Teams are ideally self-motivated, and self-organizing but they are provided with a general framework for their innovative activities. Since B&G's initial work with "champions of innovation" the technique has evolved somewhat. There are now six steps, numbered "0" through "5".[11] The steps are described in detail in the next chapter. A summary listing is provided in Table 5.2.

Table 5.2: Champions of Innovation: Steps 0 through 5

Step	Description
0	Team with Mandate • Identify 6 to 8 team members from multiple disciplines • Secure mandate, budget and member commitment for 4 months
1	Scan for Cues • In application areas of interest, scan last 6 months for newsworthy accounts of innovation • Create "strawman" document
2	Direct contact • Identify "champions of innovation" and arrange direct contact with team • Capture salient new information in trip reports
3	Group creativity • Generate individual then group suggestions for novel solutions, evaluation by team • Rank-order 20-30 concepts
4	Screening concepts • Estimate relative attractiveness applying established criteria • Backcasting future feasibility scenarios
5	Investment decision • Convince 'acceptors' of appropriate investment alternative • Formalize external relationships, business plans and commercial expectations

The champions of innovation process can be summarized as a framework which institutes an overall process of divergence and then convergence, with several internal stages which include divergence and the convergence on a smaller scale. A comparison of the steps is set out in Table 5.3 below.

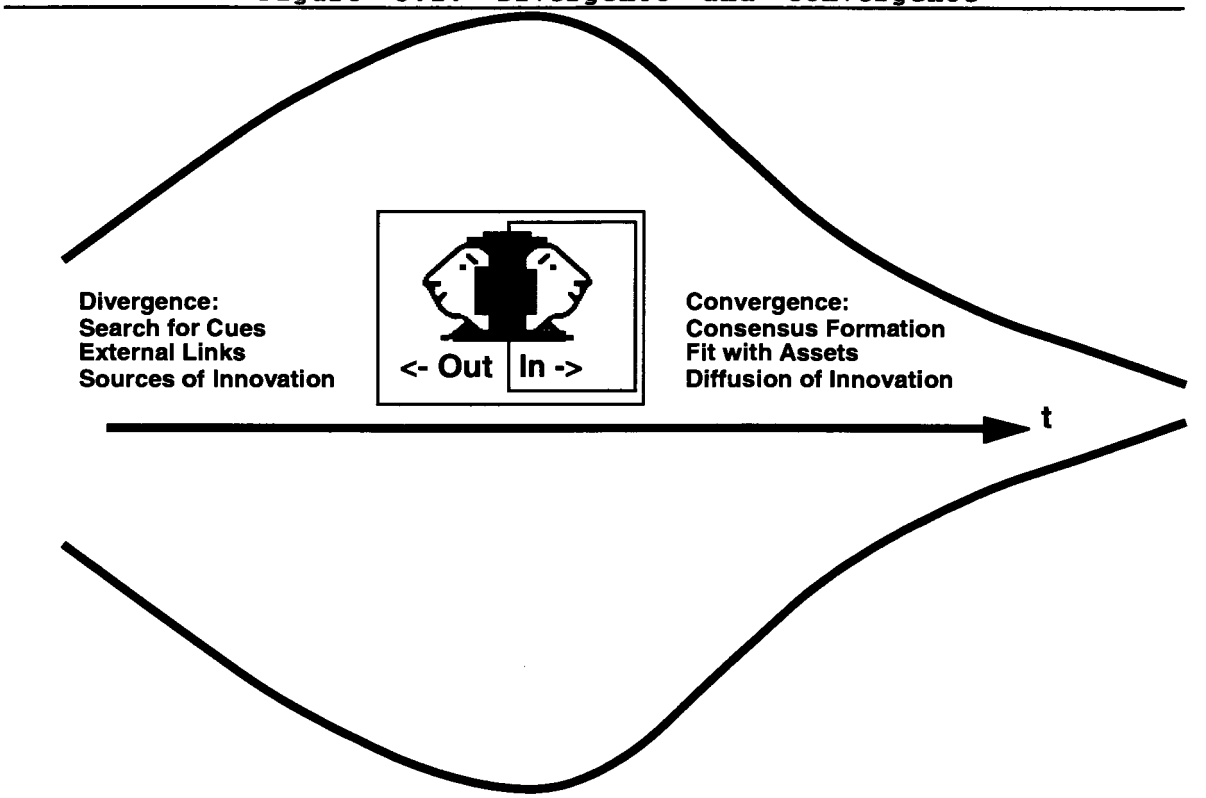
Table 5.3: Divergence and Convergence in champions of innovation

Divergence	Convergence
Identify a list of potential opportunity areas to probe	Select one area for team action
Scan the popular, industry, technical, and scientific literature (last six months only) for articles on the selected topic.	Create a 'strawman' document summarizing the team's best guess of trends and directions.
Identify range of "champions of innovation" within the scanned materials.	Select the best champions for face-to-face visits.
Conduct face-to-face visits with user and product/service champions	Write trip reports on the learning from each site.
Brainstorm on business opportunities based on experience, scan, and visits.	Identify top opportunities for further refinement.
Prepare 'opportunity screening guide' data sheets on each opportunity.	Create final report for presentation.

The first part of this chapter presented some background on two techniques that have been used to enhance the concept formulation stage of new product development. Both attempt to go beyond 'normal' market research in order to provide better information for decision-making on significantly new products, or significant changes, sometimes described as "architectural" changes.

Figure 5.1 provides a graphic illustration of the divergence-convergence process:

Figure 5.1: Divergence and Convergence



Endnotes

[1] Booz-Allen & Hamilton's typology of 'stages of innovation' has been divided into a 'front end' and a 'back end' by Axel Johne. The front end stage, as well as Bailetti & Guild's concept of "formulation" provide examples of two models.

[2] Cited in (Bailetti & Guild, 1991b: p 291)

[3] Not that companies do necessarily notice and adjust, hence the infamous "buggy whip" stories. Both stage coaches (overtaken by steam engines) and telegraph companies (superseded by telephone) had plenty of warning before their eventual successors became marketplace successes.

[4] von Hippel presents a comprehensive list and summary of previous research in the area - see pages 102-106 in "Sources of Innovation." See also (Adamson, 1952; Adamson & Taylor, 1954; Allen & Marquis, 1964; Birch & Rabinowitz, 1951; Duncker, 1945; Luchins, 1942).

[5] Rogers and Shoemaker suggest that "the early adopters of a novel product or practice differ in significant ways from the bulk of the users who follow them." Some of informants during this research suggested that this possibility is understood to varying degrees by new product developers when discussing the future with lead users. The danger is that the lead user will reveal needs that are **not** general in the population in the years to come. We don't have an explicit technique -- other than common sense -- to guard against this.

[6] Urban and von Hippel (Urban & von Hippel, 1988) acknowledge this as a problem and suggest that "one may lessen the chance of error when in doubt by selecting several candidate dimensions and screening lead users on each of them..." (p.580).

[7] An "application probe" is not defined in the paper except for an earlier reference to market probes, which include consumer surveys and interviews.

[8] Burns and Stalker (1961) (Burns & Stalker, 1961) cited in Cohen and Levinthal (1990) (Cohen & Levinthal, 1990).

[9] Others on boundary spanning include (Allen, 1977; Ancona & Caldwell, 1987; Ancona & Caldwell, 1990; Ancona & Caldwell, 1992; Bowen & Schneider, 1985; Burgelman, 1983; Cohen & Levinthal, 1990; Garvin, 1993; Quinn & Mueller, 1963; Tushman, 1977).

[10] Although it was not the subject of this inquiry, complexity and interconnectedness are significant features of the social, political and eco-system impacts an organization must consider when implementing change. Here, too, teamwork will be an essential element in describing a holistic solution.

[11] The numbering scheme was chosen to allow the original four steps to remain more or less intact, with one step added at the beginning (step "0") and one at the end (step "5").

Chapter Six

Study one

This study poses the question: "How can a team-based, systematic process for new concept formulation succeed in telecommunications services?" The format for the research is an in-depth longitudinal case study with researcher participation over a period of two years. The chapter includes a description of the questions/objectives of the study, a description of the participants and their environment (their organization and its circumstances at the time of the probe and since), the role of the action researcher, and the results. Though an unexpected outcome, compelling evidence is offered concerning an organizational barrier to innovation. In response, a model of the formulation process and its relation to the organization as a whole, is advanced.

Background

This is the first of four studies on the innovation process in services organizations. It has been argued that the services innovation process is largely uncharted territory for social scientists and management practitioners (Barras, 1986; de Brentani, 1989; Easingwood, 1986; Martin Jr. & Horne, 1993; Mitchell, 1989; Wright, 1990). In many cases the perception among participants is that services "just happen".[1] A recent comprehensive look at what constitutes successful service innovation came to much the same conclusion (Martin Jr. & Horne, 1993). This is the first in a set of four research studies that aims to clarify the innovation process for services by approaching the problem incrementally. This study begins the process with an in-depth look at

one firm's first steps in service innovation: concept formulation. In order to do this the author participated with a team in a service firm and asked two questions: how does the concept formulation process work? Why does it work or not work?

The word formulation is used here to describe the process firms use to identify technical and market opportunities congruent with organizational strategy and achievable by organizational skills.[2] Several reviews of the innovation process as a whole note that this 'pre-development' process has not been managed in a systematic fashion (Booz Allen and Hamilton, 1968; Booz Allen and Hamilton, 1981; Page, 1993) despite evidence that systematic processes are linked with new product success.[3] Eric von Hippel along with Glen Urban, and more recently Bailetti and Guild, developed methods for managing the formulation stage of new product development but have so far focused on goods rather than services (Bailetti & Guild, 1991a; von Hippel, 1986).[4]

The research reported here is part of a larger research project on numerous aspects of the formulation process, technological change and innovation. The project is chaired by Dr. Paul Guild and known as the Chair in Management of Technology: Innovation and Change (Guild/MOT). This researcher set out to extend the current state of the art for managing services formulation in a high technology setting. Based on a preliminary analysis of the industry, telecommunications services firms were identified as being both strategically important to national and regional economies and subject to significant pressures to innovate. A telecommunications services firm in Canada agreed to participate in the study by initiating a concept formulation probe.[5] (The name of the firm

has been disguised. It is referred to as "ABC Telephone Company" or "ABC Tel" throughout this study.)

As part of the Guild MOT research, a systematic technique for formulating new business opportunity concepts (Bailetti & Guild, 1991b) was identified, adapted, and applied within ABC Telephone Company. This study describes some of the adaptations made to the technique since its previous application, the participatory action research conducted after the technique was adapted for services in 1991-1992 and follow-up evaluation research in 1992 and 1993.

Why would a telephone company wish to investigate new methods for product formulation and why would it seek out a technique developed outside the firm and one which explicitly targets external innovators for insight? The remainder of this section answers these questions by describing the context for the research: the competitive environment for the participating organization as well as a description of the firm. The section also includes a description of the circumstances in which the technique was implemented; the participants, their responsibilities and backgrounds; and the role and background of the researcher.

The following two sections provide details on the research questions and the theoretical propositions that underlie those questions and the research strategy used to collect the data and analyze the results. The last section is a review of the results and a preliminary view of a model of the formulation process as it occurred in this firm.

Environment

Innovation takes place within a unit within a firm. It also is affected by larger forces outside the firm.

Technical

The formulation technique described here is focused on collecting information from outside the organization. It was implemented by and for a single firm, not by an industry association. The research was conducted during a period of rapid change for telephone companies. Two trends apparent in this change suggest why the company considered it important to support this sort of research and undertake a project of this nature. The first trend is the extent to which change is being driven by forces outside the industry. The second is the extent to which individual telephone companies face unprecedented uncertainty. These trends provided the incentive for firms to investigate techniques which look outside the organization for new product development ideas. They also suggest why a firm might do so independently of the national and international bodies that bounded change in telephone services in the past.[6] Both of these trends are elaborated below.

First, by the early 1990s is was clear that changes in technology, markets and competition started to emerge from firms outside the established telephone companies.[7] Technological change is not new to telecommunications, but until relatively recently the telecommunications industry looked internally, to their own engineers, network architects and regulators, for regular but predictable and incremental changes in the technical and business environment.

This changed as a result of a series of technical changes in the 1970s and 1980s, mostly centred on the increasing capacity and declining price for computation, disk storage and random access memory, which had and continue to have major impacts on the telecommunications services business. For example, telephone switches have evolved from elaborate

electro-mechanical devices which virtually depended on a close relationship to the network designers to digital switches based on standard protocols and implemented in software.[8] As a result a large competitive business grew in the provision of central office (CO) and private branch exchange (PBX) equipment. This scenario has been played out repeatedly throughout the telecommunications industry as independent suppliers emerge to fill niches and take market share from providers formerly assured a technical, economic, or regulated monopoly.

The trend is not solely in one direction. The ability to acquire, compress, transmit and decompress digitized versions of voice and video efficiently has evolved to such an extent that telephone companies can consider competing in new fields such as pay per view delivery of movies and other entertainment. Advances in technology simultaneously make it possible for non traditional competitors to enter the business (a cable-TV company could consider offering local telephone service based on advances in wireless telephones) and make it attractive for the telephone company to enter theirs (as in the pay per view example above). These technological advances would be unimportant if they were not accompanied by regulatory changes as well. In almost all western countries the pattern has been some form of privatization (in the case of national monopolies) and the introduction of competition in specific market segments (e.g. cellular, long distance, value-added services).[9]

The second dimension of change, the uncertain future for individual firms because of existing or impending competition,[10] appears despite a rosy outlook for the telecommunications sector as a whole. Until the 1990s, financial pressures and market forces were relatively insignificant drivers of change. Once the population was convinced of

the value of the telephone at the turn of the century the only market question in succeeding decades was how quickly service could be delivered to waiting customers. The industry also proved exceedingly accurate in predicting and managing demand on its networks: charts from AT&T illustrating predicted and actual use of long distance services indicate an almost one to one correspondence.[11] As a regulated, and in some provinces government-owned, monopoly with a popular and eventually "essential" service, telephone companies enjoyed a guaranteed rate of return which removed financial uncertainty.[12]

This shifted in the 1980s with limited competition in terminal equipment. The court ordered breakup of AT&T in 1984 and the ensuing competition in telecommunications services in that country provided a vivid example of things to come in Canada. Competition for long distance services was mandated by the Canadian Radio-television and Telecommunications Commission (CRTC) in July of 1990.[13] By the beginning of the 1990s, it was clear that telephone companies in Canada were on the brink of considerable change. Many in the industry were left with a sense of both unbounded promise and unprecedented uncertainty.

The nation

Telecommunications is one of Canada's largest, fastest growing (Canada, Department of Communications, 1992) and strategic (Bar & Borrus, 1987; Science Council of Canada, 1992a:v) industries. The service (i.e., everything but equipment) side of the industry grew rapidly through the 1980s and early 1990s[14] and is projected to continue to grow faster than GNP for the remainder of the decade. Telecommunications is considered a strategic industry because of its role as an enabling technology for information. Information is a key

aspect of the production and exchange aspects of the economy. As a recent report concluded, "Telecommunications is the foundation of the information revolution and, as such, constitutes one of the world's fastest growing and strategically most important sectors" (Science Council of Canada, 1992a:v).

Although telecommunications is large and strategically important it is also undergoing rapid change. Several factors, including technical and financial convergence, regulatory upheaval, policy initiatives, and changing customer needs and desires are causing telecommunications to be in a state of flux.

Technical convergence has been discussed above in the context of changes overtaking the industry. Regulators are aware of these changes and are attempting to anticipate their potential impact. The convergence of computation, communication and broadcast technologies means that regulators cannot count on the technological definitions to define the boundaries of their mandate. One of the most obvious examples of this trend is the use of fibre optics and cell-switching to allow telephone companies to deliver video signals to the home.[15]

Financial convergence is simultaneously driving and reacting to the technical convergence. Mergers, acquisitions, and joint ventures are sweeping the computer, communication and entertainment industries. The $3.5 billion merger between Maclean-Hunter and Rogers in the spring of 1994 is typical of this phenomenon.

Rapid regulatory change, also discussed above, began in the U.S. in the late 1970s.[16] Regulatory changes are also transforming the Canadian telecommunications industry. The most prominent regulatory shift in Canada as well as the U.S. is the move from regulated monopoly for the

provision of service to competition, first in terminal equipment and more recently in long distance carriers and ultimately local service (pending).

Policy initiatives such as the National Information Infrastructure (NII) in the U.S. and Canadian Network for the Advancement of Research, Industry and Education (CANARIE) are a fourth driver for change in the telecommunications service business. During the 1960s, the national government through government departments (Department of Communication), research funding agencies (National Research Council), and government labs (Communication Research Centre) and crown corporations (Telesat Canada) successfully championed the provision of television and telephone service via satellite. As a result the nation saw much improved coverage for remote communities. In the early 1980s, however, an initiative in home data delivery (a form of videotex called "Telidon") foundered and since that time government policy toward telecommunications has restricted itself to maintaining the "price to value" regulatory blanket in Canada.[17] The current government's interest in telecommunications infrastructure projects reflects their election platform of enhancing infrastructure throughout the economy. The CANARIE initiative, which has been in existence for at least five years, is now a government priority and is getting a great deal of attention. Telephone companies are active participants in CANARIE.

Finally, customer needs for and attitudes toward telecommunications services are changing rapidly. Social and technological trends are both necessitating and enabling phenomena such as home shopping, the extension of the office into the home, the home-based business, and the "mobile professional."

The company

ABC Tel is a telecommunications services corporation operating in Canada. In addition to divisions responsible for the operations, marketing and sales, finance, human resources and training, they have an R&D subsidiary, a cellular communications subsidiary, a telecommunications equipment manufacturing subsidiary, and joint ventures with a telecommunications equipment firm for the development of software for the control of telecommunications switching devices, and a computer equipment and computer services firm to provide data processing services.

The main telecommunications carriage company is a member of Stentor, a national consortium of telephone companies in Canada. They participate with the other eight members of that organization in the technical and financial coordination, public policy and research and development objectives of that group.

The company's sponsorship of this research into improving the quality and reducing the interval for new service development was inspired by a growing awareness of the rapid change engulfing telecommunications firms in Canada. At the time of the research, hearings were underway to open long distance telephone service to competition. New services, such as ISDN, cellular telephone service, calling number identification, home banking were either in trials, under discussion or being deployed in the Canadian marketplace. The division of the company which sponsored and spearheaded the formulation team discussed here was responsible for network architecture and design. They were responsible for specifying the equipment and implementing in the first instance many of these new services or providing the interconnection capabilities for competitive

(cellular, alternate long distance) services. The buffeting produced by these developments accentuated their desire to be able to both act more quickly as well as implement new services pro-actively.

The Technique

As mentioned above, the author participated in a program of research which identified a technique for formulating new business opportunity concepts (Bailetti & Guild, 1991b) and adapted and applied it in the ABC Telephone Company.

The technique was originally developed by Drs. Antonio Bailetti and Paul Guild. It is a variant of the 'lead-user' method developed by Eric von Hippel (von Hippel, 1986). Because of differences in approach and emphasis, Bailetti and Guild later chose to differentiate their work by calling this method "champions of innovation" (champions, or COI).

Capell's work with the BellSouth group of companies in 1988 established the potential for lead user type methods in telecommunications services (Capell, 1989). Capell identified the presence within telecommunications companies and their customers of the four key preconditions for successful application of lead user methods: important trends exist, lead users exist, mutual benefits are possible, and effective methods can be implemented to involve lead users in the new services development process.

The champions technique has three main elements. First, the technique relies on the systematic application of staged, time-boxed processes to achieve a specified objective within a pre-determined time. Second, these processes are carried out by a multi-functional team, the "formulation team". Third, the technique is characterized by a high

degree of direct contact between the formulation team and exceptional innovators from outside the company.[18]

Participants

Three sets of participants were actively involved in this research: corporate sponsors, university researchers and employee team members. The champions formulation technique was guided within ABC Tel by a group of six director-level managers. This group was led by the individual who was also the liaison between the Guild/MOT research project and the company. The university researchers included Dr. Paul Guild, who directed the overall project, and Richard Smith. Each of the six managers sponsored one or two participants for the formulation team. The results reported here were collected while the author was a participatory action researcher[19] on the Guild/MOT project. The formulation team was assisted by the author, who acted as a facilitator as well as participant in the process. Detailed descriptions of each group of participants follows.

The Acceptors

Two director/vice-president level executives sponsored this investigation. They enlisted the cooperation of other senior managers who provided team members and participated on a steering committee that set the terms for the research, met periodically to review interim results and undertook to implement the results of the probe. One of the executives, a vice-president with the research and development arm of the telephone company, provided two team members for the project. Four other managers in the telephone company also each sponsored a team member. The telephone company managers also participated as 'acceptors'[20] of the ideas produced by the team. The acceptor group

included managers from Advanced Network Planning, Strategic Marketing, Business Communications, and Telematics. Including the two executives, there were six acceptors in total (one for each team member).

The Researchers

The university researchers included the principal investigator for the overall project, Dr. Paul Guild ("the chair"), and the research associate to the chair and author of this study, Richard Smith ("the author").

Dr. Guild, formerly a research scientist and director in an industrial setting, returned to academic life in 1990 and brought his experience with the champions technique to this industry-sponsored research setting. The chair modified the champions technique based on his experience of its use in industry and recent developments in innovation management. Guild brought to the project a larger research agenda of which the present study was a component. The chair transferred the technique to the telephone company participants and trained the author in the use of the technique.

The author sustained three roles while the team was active. He participated in the innovation process as a full team member. This meant attending all team meetings, contributing to team research and participating in site visits with the team. The author also served as a facilitator and liaison between the chair and the team and acceptors. He interacted on a daily basis with the research chair, who lived in a different city, through telephone calls and electronic mail. He relayed questions and concerns that the team had and carried out, under the advice of the chair, the staged champions of innovation process between monthly visits by the chair. The author also acted as a

researcher/participant carrying out an inquiry into the process. The current document is the result of that inquiry. A doctoral candidate in communication, the author had experience as a consultant and research assistant in the field of technology management and information technology.

The Team

The team was made up of six people. The literature on team work suggests that the optimum number of people on a high performance team is between six and nine (Katzenbach & Smith, 1993b; Thamhain, 1990). Each person was identified based on their interest and expertise and asked to participate by a manager from the 'acceptor' group. Each represented different parts of the organization. Two participants came from the research arm of the company. "HT" was a research scientist (M.Sc.) from Network Systems Engineering, and "TP" was an engineer working in Business Development. Two team members came from the Strategic Business Development group. "HA", was a financial planner, and "MM" had an MBA and a background in marketing. "CA", an engineer, came from the Engineering and Network Planning group and "SC", another MBA, came from the Information and Information Services group. The diversity of backgrounds was deliberate. The "champions of innovation" technique calls for multi-functional teams as a way of ensuring adequate absorptive capacity in the team.

Five of the members participated a minimum of one day per week throughout the six month probe. One team member was temporarily reassigned by her manager and did not participate in the site visits but returned to the team in the final month, albeit in a lesser capacity. The team did not have an assigned leader but one of the team members was

assigned full-time to the project and carried out most of the administrative duties, including acquisition and furnishing of a common work space, specification, installation and setup of computing and telephone resources, and arrangement for photocopy and fax services. Travel arrangements were handled by a corporate travel agent. A research librarian was available to the team and assisted in the preparation of on-line database searches.

The champions technique as it was applied at ABC Tel consisted of six stages with specific tasks and objectives for each. All team members participated in all stages and were fully briefed as to the purpose, rationale and expected outcome from the stage. One of the objectives of the collaboration between the sponsoring company and Guild/MOT was that the technique would be transferred to the organization.

Research questions

The overall objective of this thesis is to better understand *how teams can excel in the acquisition, processing, and presentation of information that enables services formulation in the telecommunications sector of the economy*. For the present study, a program of participatory research extending over a two year period was undertaken to obtain first-hand in-depth knowledge of the innovation process for services. Bailetti and Guild's work with the research arm of a telecommunications equipment manufacturer indicated success with the champions of innovation technique in those circumstances. Capell's work with a telephone company established the preconditions for lead user investigations in the telecommunications services industry.

This study builds on previous work and extends the understanding of telecommunications service formulation. For this reason, a detailed description of the "champions of innovation" technique as it was conducted in this case is included in the results. This descriptive account was possible because the author participated and observed the technique as it unfolded. As a participant in the process, the author had a first-hand perspective of the formulation process for telecommunications services. The champions technique as applied in ABC Tel company was substantially different than previous applications (Bailetti & Guild, 1991a; Bailetti & Guild, 1991b). The research documents these changes, identifies improvements and reports directions for further improvement. Also, in past applications of the method there was little or no formal documentation of the staged process -- certainly not as a detailed longitudinal study.

An unexpected outcome of the study was the identification of organizational barriers to innovation connected to systematic formulation techniques. The characterization of these barriers, in the form of a rough model, became the second objective of this study. Given the limited previous work in this area, it was deemed desirable to develop a preliminary model of the pre-development innovation process for telecommunications services. The goal was to identify information flows and bottlenecks in the formulation process for new telecommunications services. At this stage in the research it was not clear what components such a model would to contain. This study seeks to identify the components of the model and the direction of their interaction.

Data

One rich source of data for this study was the field notes and experience of the participating researcher. Additional sources of data were used to augment participatory results. As the technique progressed the team produced a great deal of its own output in the form of interim reports, presentations, lists, categories, information collected manually and electronically, trip reports, opportunity statements and recommendations. This material was retained and analyzed where appropriate. Additional data were collected from the following sources: team members were surveyed twice (during and after the team activity); two in-depth interviews were conducted (one immediately after the team made its final report and then again one year later); the results of a team-building exercise with a professional facilitator were kept; a group de-briefing session was held after the final report; and interviews with selected members of the acceptor group were conducted.

The data were collected in participatory activities and in real time. They are presented chronologically in the results. The following time-line provides an outline of the team's activities and the data collection which occurred at each stage. The level of effort and duration of each stage for which the team was active are also indicated.

January-April, 1991:

Activities: Negotiations were held with ABC Telephone company to obtain their participation in the research. Two executives within the organization coordinated these activities with the researcher.

Data collection: The researcher collected data in the form of meeting notes.

Effort: Thirty person/days.

Duration: Four months.

May 1991:

Team activities: Two Meetings were held with executives and their managers to discuss research objectives and company objectives. The researcher presented the steps in the technique and expected outcomes. Executives agreed to participate, identified an overall budget and made a preliminary selection of managers (the "acceptor group") who would sponsor team members and receive the results. A topic area was selected for the "champions of innovation" probe.

Data collection: meeting notes.

Effort: Six person/days.

Duration: One month.

June 1991:

Team activities: The acceptor group and the team members they sponsored met with the researcher to learn more about the technique and assign roles and responsibilities. The team of six moved into a shared space and learned the details of the "champions of innovation" technique in a series of meetings with the researcher. They began their work by doing an "environmental scan". Keywords were identified for database searches. The results of the environmental scan were categorized by technology and service application area themes and cross-referenced by location. "Champions of innovation" in telecommunications services and equipment suppliers were identified.

Data collection: meeting notes, field notes, documents collected by the team.

Effort: 50 person days.

Duration: One month.

July-August 1991:

Team activities: The team created a "strawman" document reflecting their own perspective on the application area as well as the results of the scan. Results of database searches were used to refine and follow up environmental scan results for selected firms. The team met with acceptors to report their findings to date. After a technique review session with the researcher, the team completed a questionnaire about their confidence in the technique. After a brief summer break, the team took part in a day-long team-building exercise conducted by a consultant. Trips were planned, with champions grouped on the basis of geographic proximity. The team divided into two groups to enable wider coverage of site visits. Individual team members were responsible for organizing each site visit, contacting champions, arranging dates and times of meetings. Thirty-three of thirty-four sites contacted agree to a meeting.[21]

Data collection: field notes, meeting notes, documents collected by the team, documents produced by the team (strawman, acceptor presentation document, lists created during the team-building exercise), questionnaire.

Effort: 20 person days.

Duration: Two months.

September-October 1991:

Team activities: The team began a series of site visits with champions. Additional subject matter experts from within the company were contacted to accompany the team on selected visits. The team visited a total of 33 sites. The researcher accompanied the team on four trips to 15 sites. Trip reports were created for each site visit. When

the site visits were complete the team took one week to rest and finish trip reports and then started a week-long brainstorming session to identify potential opportunities. At the end of the week opportunities were ranked.

Data collection: field notes, site visit notes, trip reports produced by team, brainstorming notes and team output from brainstorming session.

Effort: 9.5 person months.

Duration: 2.25 months.

November 1991

Team activities: The team completed an "opportunity screening guide" for each of the top twenty ranked opportunities. These were ranked again and the team identified their top pick as well as two supplementary opportunities. Detailed opportunity screening documents for these top three were completed. The team located and assimilated additional information on the opportunity areas from sources within and outside the company. This material was used to create a presentation for the acceptor group.

Data collection: field notes, documents produced by the team, documents collected by the team, presentation materials produced by the team, meeting notes.

Effort: 1.5 person months.

Duration: 1.25 months.

December 1991

Team activities: Based on feedback from the acceptor group, the team revised the presentation. The team presented it to the acceptors. The team wound up operations.

Data collection: Field notes, meeting notes, presentation materials.

Effort: 1 person month.

Duration: .25 month.

January 1992

Team activities: Team no longer active. The team got together to make a presentation to a large group of senior managers.

Data collection: Meeting notes, presentation materials.

Effort: .25 person month

Duration: .05 person month.

February-March 1992

Team activities: Team no longer active. Team members met individually with the researcher to review the experience. The team got together for a group 'debriefing' with the researcher. A questionnaire was completed.

Data collection: interview notes, videotaped interviews, notes from debriefing, questionnaire results.

April 1992-March 1993

Team activities: Team no longer active. Individuals from the team worked on follow-up projects within the organization or returned to regular duties.

Data collection: notes from informal contact (telephone, electronic mail, personal contact) with individual team members.

April 1993

Team activities: Team members met individually with the researcher to review the champions of innovation probe and the impact it had on the organization. Team members completed a questionnaire for the researcher.

Data collection -- interview notes, questionnaire results.

Results

The champions of innovation process at the telephone company started with the selection of the general area to investigate, continued through to the final report and ended with interviews with team members one year later.

Selecting the topic and selecting the team (step 0) (Spring 1991)

The first step for the telephone company was to select a general area to probe. The article by Prahalad and Hamel on core competence suggests that 'unbridled, but not un-corralled' inquiry is the best approach when searching for new business opportunities. The purpose of the initial meetings was to define the area and set up the parameters for the 'corral'. The chair and the author met the acceptor group on two occasions: to explain the innovation technique and clarify what the telephone company would be expected to do. Once those concerns were dealt with, the acceptor group turned its attention to a subject area for the team to focus on.

Although the acceptor group might have chosen a business opportunity area (e.g., telephone set leasing) or a new market opportunity area (e.g., expansion outside the current serving area), they chose a new technology area instead. This area was similar to ones previously undertaken by the chair and allowed a cases comparison (see next chapter).

Having made the selection, the acceptors, in cooperation with the sponsor, identified team members suited to the task and willing to participate in the process. It was made very clear from the start that people could opt out if they felt this was not something they wanted to be involved in. Six team members were identified, one full time, two at

60 per cent, one at 40 per cent and one at 20 per cent. The first step was a group of "acceptors" was formed and discussions were initiated to identify not only a topic area to explore but the best team members with the most appropriate set of skills to create a dynamic absorptive capacity.

The team was expected to execute the champions of innovation technique and report back to the acceptor group in six months. Prior experience in another organization suggested that getting to this stage often took much longer -- as much as three times as long. The team's expected 'deliverable' was a presentation which would include two or three recommendations for business investment.

Meeting the team and setting up

The team was assigned a meeting space and on average they met two to four days a week. The champions of innovation technique was new to the team and not surprisingly there was uncertainty and concern. Therefore the chair and the author met with the team frequently to discuss strategy and objectives.

Executing the technique (steps 1-2)

The team's first task was to scan the environment (in technical, popular, and business periodicals) for individuals who fulfilled the criteria of "champions of innovation". The operational definition of a champion of innovation is that they appeared in the news in the past six months, have brought something to market, and have initiated a significant investment on the part of their organization in this new technology, business, or market.

Team members started by compiling list of thirty relevant publications, including some from the telecommunications trade press,

some from other technology areas such as electronics and computers, popular business publications such as Fortune and Business Week, and general publications such as Time, Newsweek, and MacLean's. These were scanned in order to identify champions and familiarize the team with a broad range of issues relevant to the area of inquiry. Team members were advised not to attempt a thorough reading of the articles. Instead, they photocopied pages and used yellow highlighter pens to identify champions and key concepts. The photocopied pages were collected in binders and as they grew in numbers were assigned to categories. The categories, which grew to about seventeen in the end, were based on key technologies.

As the team members grew more familiar with the topic area and current trends, the manual scans were supplemented with electronic searches. The searches were carried out by a professional librarian but the search strategies were based on team input and keywords identified by the team. Team members reviewed the results from on-line searches based on article titles and requested abstracts of those that appeared interesting. On-line searching was also used to obtain additional financial and contact information for organizations when this was not present in the articles.[22] The scanning process took approximately two weeks and two person-months of effort.

Performance measures at this stage are relatively straightforward and consist of the number of publications scanned, the number of articles selected and sub-topic areas identified. In the case of the services probe, thousands of articles were scanned from over forty publications. Additional tens of thousands from hundreds of publications were covered by electronic scans filtered through keyword searches. The team of six spent on average about 12 person days over a six week period for a total

of two person months of effort. The result was a set of over 700 innovation articles. These articles were scanned and more than 350 keywords were extracted. In addition over 200 potential champions and almost 400 "suppliers" were identified. The team felt overwhelmed with information. Although the objective was divergence, some resisted and wished for more time to consider what they were reading. Some were uncomfortable with the task of being asked to 'read magazines' on company time and reported jibes from co-workers who wondered what kind of a task this was.

As mentioned above, the overall mode of operation taken by champions of innovation is one of divergence and then convergence. Each of the steps also contains an element of divergence and convergence as well. In this case, the scan of the environment was followed by a focus on what was learned. They did this by creating a document synthesizing their previous knowledge, their recent exposure to trends and innovations, and their collective discussions. This document took the form of a set of overhead slides that could be used to introduce the team and its mission to other people. It consisted of a set of research questions and preliminary estimates of directions and drivers of change. It was felt that discussions would proceed more smoothly if there was a clear set of statements with which the champions could either compare or contrast their experiences. It would also serve a secondary purpose of establishing the team's credentials as having spent some time considering their mission, not merely fishing for information. The chair reminded the team that there is a certain element of having to give something to get something back. At the same time, the document did not

contain secret or proprietary information nor was it expected that the people the team would be visiting would divulge such information.

The second convergence task, which ran parallel to the first, was to produce a "strawman" document representing the team's best view of what was going on in the investigation area, based on their experience, the environmental scan, and their team discussions. The strawman document is intended to be used as a discussion beginning point for face-to-face meetings so it does not contain any secrets or proprietary information. At the same time, it is being used to demonstrate to the site being visited that the team members are taking this effort seriously. A side use of the document is as a reporting tool back to the managers and change agents responsible for the team. This document, along with the environmental scan data, becomes the basis for the usual first progress report by the team. The strawman document is also a helpful milestone since it ensures that the team members are thinking together and have a common understanding of the key issues and opportunities ahead of them. The strawman document was produced in the form of an overhead presentation with about ten slides. Stapled copies of the strawman document, with photocopies of the visiting team members' business cards, were distributed at site visits. As a prelude to the next stage, and the final act of convergence, the team members divide up the task of contacting potential site visits and arranging face-to-face meetings.[23]

Although the team anticipated the need to revise the strawman document, and discussed this possibility, the document remained the same throughout the site visit process. Team members used it differently, as suited their style of presentation, but none expressed regret or misgivings for the statements it contained. In fact, the document became

something of a source of pride for the team after they received compliments about its assessment of trends from several champions.

Once the strawman document was created, the team re-examined their collected articles and began the process of identifying the champions they hoped to visit. The technical categories were overlaid with a set of 'vertical markets' for telecommunications based on the knowledge and experience of the team. Champions were identified in each of several key vertical markets and these were overlaid with a geographical location, to help in the planning of trips. The team then attempted to come to consensus on the "must have" champion visits. Again, convergence followed divergence. Considerable debate sprang up around who should be visited, and by whom.[24]

The next step called for convergence, in two ways. The first convergence task required that the team narrow down their identified champions and suppliers into potential site visits. This process was the source of considerable debate but in the end sixty champions and thirty suppliers were identified as potential site visits, with this being reduced to 20 and 10 in a final selection.[25] Sites were classified according to a rating scheme which ranked them as essential, very desirable, desirable, and nice to have. (See Table 6.1)

Table 6.1: Rating Champions and Suppliers

Rating	Champions	Suppliers	Totals
Essential	2	6	8
Very desirable	11	12	23
Desirable	8	10	18
Nice to have	5	5	10
Totals	26	33	59
Target	20	10	30

Evaluation I

At this point in the process, the team was evaluated by the author. The team members were asked to complete a self-assessment of how well they thought they were doing in identifying innovation drivers. Four such drivers, including changing customers, changing technology, changing competitive relations and changing regulation, have been identified in the literature (Sheth & Ram, 1987). The evaluation took the form of a questionnaire distributed to the team while they were in the process of finalizing their selection of champions to visit. Team members were asked to indicate their confidence in the team's performance on the four innovation drivers as well as questions about how the team was doing in terms of achieving its overall objectives, whether the technique could be used effectively by their company and whether the company would be able to act on the recommendations. Responses were on seven point (Likert) scales.

The questionnaire was circulated to all team members and they replied anonymously. The responses were collected and tabulated immediately and the results shared with the team. This is in keeping with the participatory nature of the research at this stage.

The first question asked how confident the team member was that the team "achieved its overall objectives of identifying and quantifying new service and product opportunities for the company" related to the area of interest. In this and subsequent questions, responses ranged from (1), "Not at all confident" to (7) "Extremely confident." The average response was 5.33, with an N of 6 and a Maximum of 6, minimum of 4 and a median of 5.5. The variance, at .67, was relatively low, indicating agreement among the team on this point. The result is consistent with

the researcher's notes from the time, that the team was excited about the process and quietly confident that they were doing a good job.

The second question asked how confident they were that "the champions of innovation method can be used effectively by the organization for the purpose of merging exploratory technical research breakthroughs with potential market applications." Here the average response was 4.83, with an N of 6 and a maximum of 5, minimum of 4 and a median of 5. Team members were slightly less confident that the technique could be used effectively, possibly because they had not yet completed the whole process. The variance, at .17, was low, indicating agreement among the team on this point.

The third question asked how confident they were that their company "will be able to act upon the task force's recommendations." In this instance the average response was 4.33, with an N of 6 and a Maximum of 6, minimum of 3 and a median of 4.5. The variance, at 1.87, was somewhat higher, reflecting some disagreement among the team on this point. The variance also reflects one low response, an inevitable result with such a small group of respondents. In retrospect this finding is indicative of the different backgrounds represented on the team. Half of the team came from the research and engineering part of the company, the other half from business and marketing areas. In situations where the action threshold of the company was under question, those team members from the business 'side' of the business were less confident of the company's ability to act than the engineering types.

A summary of the responses to the first three questions is presented in the table below:

Table 6.2: The Results of the Method I

Question	Avg.	N	Max.	Min.	Med.	Var.
1. How confident are you that the task force achieved its overall objectives of identifying and quantifying new service and product opportunities?	5.33	6	6	4	5.5	.67
2. How confident are you that the 'champions of innovation' method can be used effectively for the purpose of merging exploratory technical research breakthroughs with potential market applications?	4.83	6	5	4	5	.17
3. How confident are you that the company will be able to act upon the task force's recommendations related to 'imaging' service or product opportunities?	4.33	6	6	2	4.5	1.87

The fourth through seventh questions asked the team member's confidence that various innovation drivers had been identified. Results for these four questions are presented in a table below:

Table 6.3: The Results of the Method

Question	Avg.	N	Max.	Min.	Med.	Var.
4. How confident are you that the team identified the most significant trends in imaging related to *changing customer needs?*	4.17	6	6	3	4	1.37
5. How confident are you that the team identified the most significant trends in imaging related to *technology breakthroughs?*	5	6	6	3	5	1.20
6. How confident are you that the team identified the most significant trends in imaging related to *new competition?*	4.60	6	5	3	4	.80
7. How confident are you that the team identified the most significant trends in imaging related to *changing regulations?*	3.33	6	5	2	3	1.07

On all four dimensions we see a somewhat elevated level of variance, reflecting more than anything an uncertainty about the meaning of the information collected so far and how it could be used. Again, the

overall impression of the team's attitude at this point is one of quiet confidence but certainly not cocksure.

At this point the team had collected information from magazines and journals but had not met with customers, so it is not surprising that they were slightly less confident of their ability to identify trends in changing customers than in technology. Regulation and competition were not emphasized in the search and this may explain their slightly lower scores.

Team Crises

In ethnographic research, it is sometimes observed that the unusual or unexpected events reveal the most insight, or provide an opportunity to see things which might have remained hidden for much longer without an event to bring them out in the open. Geertz's observations at the Balinese cock fights are a good example of this (reprinted in Geertz, 1973). In this case study, four events of this type stand out. The first was a mini-crisis surrounding funding for the travel portion of the method. The second was a series of misunderstandings which threatened to break the team up, an eventuality that was averted through a group communication session with an outside facilitator. The third was the ongoing threat of a corporate reorganization while the team was underway. The fourth was the heated debate that arose surrounding the scheduling of site visits.

The travel problems were part of a set of ongoing financial concerns that circled around the team from its inception. Some of the members of the team were from the telephone company, and their salaries were being paid by their respective groups. Two of the team members were from the R&D arm of the company and their salaries were covered by a research

grant from the telephone company. When a corporate edict was issued in the summer of 1991, forbidding out of province travel, the scene was set for a confrontation between the team and its sponsors. In the end the travel restrictions did not unduly constrain the team's activities. In the mean time, however, the issue and the debate surrounding it seriously sapped the team and strained relations between team members and between the team and its sponsors. The problem of money exacerbated the issue of scheduling the visits. Because of money constraints, the number of people who could go to any particular site was restricted.

The team felt that a minimum of 3 people should be on any site visit and that five was better. Part of the issue was parity. The team generally requested a meeting with the champion and "a few others." Experience from previous champions probes indicated that this usually meant a group of three to five and therefore the visiting team should be of similar size. Another, more important, concern was ability to absorb and recognize useful information. The researchers felt that one or two people on a site visit not only would not represent sufficient "absorptive capacity" (Cohen & Levinthal, 1990). With a large number of potential sources of information it was desirable to have as many receptors as possible. The number of people on a site visit was also thought to convey the importance that the company placed on those champions and therefore result in a more revealing and extended visit. Another concern lay in the fact that the participating researcher was usually able to attend, and the employees of the research company faced no restrictions but the main "customers" for the ideas -- the telephone company itself -- was in danger of being in a minority or un-represented on site visits.

As a result, people within the telephone company started to argue among themselves over who should go on which visit. It was a small matter but it was something that might have been avoided by decisive leadership action. In the end the team got on with the job and were able to work around the travel restrictions after senior management intervention but not before considerable bad feelings developed, both within the team and between the team and the organization.[26]

The second issue was more serious. When team members were selected, diversity of background as well as competence and drive were considered desirable attributes in a participant. Our team included people from a wide variety of backgrounds and with considerable professional drive. The team also subjected itself to some unusual scheduling issues by not only having several members who participated less that 50 per cent of their time but also scheduled their time for different days and hours of the day. As a result, there was less personal contact than might have been expected given the amount of time each person was putting in but more than if they were all meeting solely by telephone or in scheduled meetings. As was perhaps inevitable, personality differences and suspicions of motives resulted in some bad feelings. Part of the problem was as a result of the perception by some of the team that one person on the team was attempting to 'steer' the team in certain directions and, worse, reporting on the team's activity to their sponsor. This difficulty was largely resolved through the use of a 'retreat' format, or group session that served to bring some of the concerns into the open and allay misunderstandings. The team, however, spent a considerable amount of energy on a problem that might have been avoided.

Two useful documents came out of the retreat. The first was a consensus statement on what made an effective team. See Table 6.4.

Table 6.4: Team consensus statement A

Consensus on top characteristics of what/how to function as an effective team.

- Develop skills at quickly achieving a consensus; work to be more effective, buy in to the team process.
- Put team goals first; sacrifice personal goals; support the project, the team and each other.
- Commit time to the project.
- Be creative; have vision, know our mission, be inquisitive.
- Be prepared for work when the team meets and share your results. Have plenty of background on champions to avoid "cold" calls.
- Make speedier decisions -- be aware of time constraints.
- Be open to the opinions of others as well as offering your own opinions.
- Share motivation; be clear about shared goals and objectives, what are we looking for?
- Define and focus on what really matters; pay less time on small details.
- Appreciate each others' contributions.

The second result of the day-long retreat was a consensus statement on what were the barriers facing the team. See Table 6.5:

Table 6.5: Team consensus statement B

Forces that might prevent success.

- Lack of time.
- Manager's other goals for your total time.
- Manager values this activity less than other things.
- People not receptive to output.
- Lack of buy-in (involvement) by those taking over project.
- Changing rules, lack of management support and understanding.
- Lack of resources.
- Reorganization, changing people.
- This project not part of job appraisal.

The third issue which helped to bring into the open the extent to which the team was subject to larger forces within the organization was the ongoing rumours and eventual execution of a significant corporate re-organization during the team's tenure. All of the members of the team spent at least some time speculating on the results of this shake-up, and a few let it seriously interfere with their team activities.

Executing the technique (steps 3-4)

The next stage in the process is to diverge again by the team going for face to face visits. Although this is another aspect of the process that has been known to evoke a certain amount of peer jealousy, particularly in an organization that does not generally allow travel outside its sales region except for executive meetings, the team members did attest to the fact that it is in fact the most grueling. A typical week involved six to eight visits in four or more cities, a considerable amount of air travel and some late nights as trip reports are written up and interview questions are prepared. Since there is a team at these

visits they took advantage of that fact by holding an informal debriefing session immediately after each interview.

The team valued these debriefing sessions highly, despite the sometimes awkward logistics of conducting them during the trip. On one occasion, the team held a debriefing session, including a recorded "brainstorming" session for later transcription, while driving on a freeway between appointments. On another occasion an airport "frequent flyer" lounge was commandeered for a meeting while the team waited for one of the team members to leave by plane. The sessions provided an opportunity for team members to share insights while they were still fresh in their minds and because they were interspersed between visits, some of these insights could be explored at subsequent sites. With as many as 10 site visits in the course of four or five days, it was also essential to get information and impressions down on paper immediately to ensure that they were not lost or confused. This "brain dump", as the team started to refer to it, quickly became an invaluable tool for the member responsible for writing up the trip report and the meeting was often recorded on a pocket Dictaphone.

The team member who made initial contact prepared an itinerary for each team member as well as a short package of briefing materials. The meetings were typically between at least two people in the firm being visited and a subset of the team, sometimes augmented by a technical specialist added for that specific trip, usually four people in total. The rationale for having a fairly large visiting team, as discussed above, was to ensure that as much value as possible was extracted from each visit.

The visits typically included a presentation of the team's "strawman" document and then a discussion. The team typically requested at least two hours for the meeting but often they went on much longer. Team members probed for innovation drivers in the areas of customer needs, technical change, competition, and changing regulation (Sheth & Ram, 1987). Discussions were surprisingly frank, and although the team was clear that no proprietary information was on the table and that a non-disclosure meeting was not part of the agenda, champions and suppliers were forthcoming and informative. The champions and suppliers were also genuinely interested in the process we were undertaking and in the team's views on the subject under investigation. At 33 sites the team averaged four people from the team meeting two from the champion or supplier firm for eight interactions per visit. As many as six team members were present, and met as many as four representatives from the champion or supplier organization. A total of 81 team-member to champion and 172 team-member to supplier interactions took place for a total of 253 interactions.

Once the site visits were completed the team began to prepare for another convergence exercise. The trip reports were consolidated, subjected to a common formatting standard, and distributed to all the team members. In the course of a couple of weeks, team members discussed amongst themselves on an informal basis, the learning that had gone on. They also used this time to recover from the strenuous travel and catch up with other work tasks and family obligations. The challenge of being away four out of eight weeks, especially for those team members who were not assigned full time to the project, was a considerable effort.

This relaxed and informal convergence period was followed by a short, intense and structured divergence and convergence exercise that took place in one working week. The team called it "the lockup." The team took over a large room in a separate building and spent the first two days of an intensive week on rapid idea generation. Several paper-based and electronic tools for facilitating this process were used. Once a significant number of ideas was on the table, and the team agreed that the range of possible ideas was represented, the process of converging began. The final three days of the lockup saw the team engage in vigorous debates on the merits, overlap, ranking, and potential of the proposed ideas. Again, several paper-based and electronic tools were used to manage this process. In the end, the 50 ideas were reduced to a 'top 20' with three or four core ideas identified as requiring further exploration.

At this and subsequent stages the extent of divergence was gradually reduced. The greatest amount of divergence was encouraged at the environmental scan and face-to-face meeting stages, although still within limits. At the lock-up and later stages divergence and convergence occurred within an ever-narrowing funnel bounded by three guiding principles -- fit with company assets, fit with company direction, and fit with corporate standards for magnitude of opportunity that is worthy of investment. The first two concepts have been operationalized as core competence and strategic intent (Hamel & Prahalad, 1989; Prahalad & Hamel, 1990), the third is a return on investment threshold.

The top opportunities were assigned one last level of divergence as the teams began to delve into market research, industry profiles,

consulting reports and database searches. The objective was to create a 'first pass' business plan. Something that would indicate whether the company was wise to make a subsequent investment in creating a 'real' business plan. A rule of thumb for the team members was the so-called "80-20" objective: try to get 80 per cent of the answer with 20 per cent of the effort. For the engineers in the group this kind of guideline was foreign but it allowed the team to move quickly and still provide reasonable answers. The data from these searches, as well as the trip reports and the ideas that emerged from team discussion formed the basis for filling in 'opportunity screening guides' for the top opportunities. The opportunity screening guides covered such things as competition, time window, technology enablers, and regulatory constraints.

The results (step 5)

The team used the completed opportunity screening guides as the basis of a presentation to change agents. Presentations covered each top ranked opportunity in detail and others in the top 20 in less detail. The presentations started with the "champions of innovation" as the source for the idea, the trends and leading edge environment that formed the context and then a description which included problem statements, business opportunity, identification of how customer value is created and finally the 'service/product opportunity concept.' Opportunities were operationalized according to guidelines proposed by Keen (Keen, 1988).[27]

The final stage in the process involved little divergence and convergence. At this stage the team presented their ideas to senior management in the form of 'first order approximation' business plans. The objective is to have senior management approve one or two for

further investment, most likely in a formal business plan and commercial specifications. Ideally, some of the team members will carry forward into this stage. In this instance two team members were formally assigned the task of fleshing out the plans for the top opportunity, in cooperation with others from other parts of the company.

A summary of the stages in the process and input and output measures is presented in Table 6.6:

Table 6.6.

Champions of innovation–Stages and input and output measures.

Stage	Description	Input measures	Output measures
0	Select topic, team	Six topic areas 10 team members proposed 10 Change agents identified 10-20 participants 1 person-month effort .5 month interval	One topic selected Six team members selected Six change agents selected
1	Environmental scan, strawman	Six team members 1 research associate 1 Principal investigator 3.5 person months effort 1.5 month interval	tens of thousands 's of articles scanned 700+ innovations 236 champions 392 suppliers Results sorted into 18 'application areas of interest' 59 potential sites Strawman document created
2	Site visits	32 visits by four or more team members with two or more champions = 250+ contacts Eight person months effort Two months interval	20 of 26 champions selected 10 of 33 suppliers selected 32 field visits 32 trip reports
3	Group creativity	1.5 person months effort .25 month interval	50+ initial concepts 24 emergent concepts, rank ordered
4	Opportunity screening	1.5 person months effort 1.25 month interval	Scope business attractiveness with first order approximation for top Eight concepts More detailed assessment for top three One top new business opportunity concept Two secondary business opportunities
5	Business opportunity statement and presentation	One person months effort One month interval	Presentations to acceptor group Presentation to senior management for decision

Evaluation II

The champions of innovation team at ABC Tel was an experiment on several levels. First, it was an attempt to build relationships between the academic research program and the practical concerns of the company. Second, it provided an additional instance of the use of the technique outside of the initial setting. The focus on services, as opposed to products, was also new for the technique. The technique was revised to reflect both learning since it had first been done as well as accommodations for the different business and business culture within the telephone company. Finally, the team activities were an opportunity for the author to participate in the innovation process. As discussed in an earlier chapter, much research on the innovation process is necessarily after the fact and deals with success. Participatory research in this area is still new and it was hoped to be able to learn more about the details of the very early stages of innovation as it is actually practiced. The various formal staged-oriented strategies for innovation proposed by authors such as Crawford (Crawford, 1983) , Booz Allen (Booz Allen and Hamilton, 1982) and Robert Cooper (Cooper, 1985; Cooper, 1990; Cooper & Kleinschmidt, 1991) have been examined in detail in the "goods" context and but little work has been done in services (Martin Jr. & Horne, 1993). It was hoped that a model of the innovation process, one which emphasized the role of concept formulation could emerge from the participatory work.

The next section focuses on what emerged from interviews with the team. The interviews were designed to reveal some basic understanding of the process and thereby assist in the development of an informal model of the formulation process.

A formal model of that process already existed in the form of the methodology itself. As other authors have described, the innovation process consists of a set of convergence and divergence activities which both the lead user method and the champions of innovation method capture in their approaches (Cooper, 1983; Quinn, 1985). By participating directly in the process the researcher sought to get a better understanding of formulation activities so that an improved version of that model could help refine formulation activities. The initial objective was to reduce the time and increase the quality of the formulation process for telecommunications services.

Interviews (January 1992)

Following the team's report at the end of January, each of the team members was interviewed individually. The interviews were videotaped and transcribed. The interviews were structured around a common interview guide being used for all six interviews. Each interview was focused on a step by step evaluation of the champions of innovation technique. For each stage, respondents were asked a similar set of questions under three headings -- 'Improving this step', 'Improving teamwork', and 'Improving quality of service' (i.e., the final results).

Earlier assessments of the lead user technique and champions of innovation emphasized the differences between those approaches and traditional market research. In these interviews the author asked each of the team members about how the technique as a whole, as well as each steps which comprised the technique, differed from their prior experience with formulation of new business opportunities. The overall assessment was that the approach was a significant improvement over what

had been done in the past. All were generally enthusiastic about the technique, with specific concerns and reservations.

Team post-mortem (February 1992)

The team actually made two final reports as a group. A few of them also made informal reports to their supervisors and colleagues. The first report, in December of 1991 was to the acceptor group only. Some problems with the presentation contact were identified at that meeting and suggestions were made for revisions to be carried out before a larger meeting to be held in January of 1992. Following their field experience and intensive group work, the team was excited about the prospects for the ideas they were bringing forward. When their enthusiasm was not equally shared by the acceptor group at the first meeting some sparks flew.

The disagreement appeared to centre around the extent to which the acceptors were willing to see the team as reliable sources of information for the recommendations they were making. From the team's perspective, the environmental scan, the strawman, the site visits and the brainstorming had given them the courage of their convictions. They knew their recommendations were correct. The acceptor group, on the other hand, had not been exposed to any of these sources of data and was reluctant to simply take the team's word for it. The team had taken an enormous quantity of information and distilled it into knowledge but it was knowledge that was difficult to express in a concrete fashion (i.e., numbers).

The team revised their presentation in order to incorporate more third party data (from purchased reports and library research) as well as include more of the background from the field visits. This appeared

to accomplish two things: add credibility to the team's recommendations and make the recommendations "come alive" for the audience. The second meeting was very well attended, with almost 50 people crowded into a medium-sized meeting room. The recommendations appeared to generate considerable interest and various 'action items' were discussed and assigned.

Toward the end of the meeting, word began to circulate outside the room that a momentous decision was about to take place. As people emerged the details surrounding the creation of "Stentor" were revealed. No doubt some of the people in the room would have been aware of the imminent change in the way telephone companies in Canada coordinated their activities, but others were taken by surprise. Although the actual terms of Stentor's creation had significant impacts on the new product development process, the more important lesson is that an event largely out of the hands of the team had a profound impact on the team's recommendations. In the months which followed key individuals were transferred to the new organization and considerable momentum was lost.

At the same time, in anticipation and then in reaction to the CRTC decision to de-regulate the long distance telephone market in Canada, the telephone companies initiated dramatic reorganizations. An earlier reorganization and travel cutback had almost derailed the original team -- this one served to dilute and confuse the team's recommendations. In both cases the team faced significant external changes that affected its ability to deliver results in a timely and effective manner. With the reorganization responsibilities changed and people who had supported the initiative no longer were involved and new people had to be brought "up to speed". Team members, who might have been expected to carry the

results back to their home department and initiate or support changes there, were transferred and/or re-assigned. The sponsor of the project was also re-assigned and became extremely busy with new responsibilities. Despite all this, the top ranking initiative was examined further, by a task force that met sporadically for another six months. And, as it turned out, some of team's learning has found its way into the company in various ways.

In the immediate aftermath of the team report the researcher gathered data from them on the process they had been through. This was done by organizing a group meeting in which the team and the researcher discussed the stages/steps ("step 0" through "step 5") that the team had been through. At the suggestion of one of the team members, this discussion was refined from an evaluation of the step to a more specific question -- "what did they think of the step itself and how would they rank the team's *execution* of that step?" This allowed the team members to be critical of their own performance yet recognize the value of a step -- and vice versa.

Overall the team ranked the champions of innovation process very highly. The researcher took notes during the discussion and also allowed team members to rank each step on the two dimensions ("concept" and "execution") according to a five point scale (1= very poor, 2 = poor, 3 = OK, 4 = good, 5 = very good). In every case the team members ranked the concept higher overall than their execution. This is not surprising given the fact that the team was new to the concept and also the tendency of people to glorify "ideas" above practice.[28] The ranking was useful in terms of identifying individual steps that seem to require more attention than others, particularly if we focus on the ranking

given to execution. The team members identified "generating the trip reports" as a key deficiency of their activity.

Trip reports received the lowest score and from the researcher's experience were not handled well. For each site visit, one team member was responsible for taking notes during the "brain dump" which followed the visit and then writing up a one to three page summary document. A template for these summaries was developed part way through the process but it was not followed strictly. Delays between the time reports were prepared, when they were circulated to the visiting team, and when they were available for the entire team to review, were common. Team members who did not take part in a visit were sometimes frustrated by the delays and the lack of details in the reports. Team members who did visit a site but were not responsible for that particular report either were late in making comments and additions or did not receive the report in time to make suggestions.

The trip reports problem lends itself very well to an information technology response. Suitably equipped team members could have shared documents by electronic mail or via on-line file sharing. Although the information technology requirements of this process was not a specific objective of the research, it should be noted that the trip reports made significant demands on people's ability to share information in a timely and mobile fashion, since teams were alternating site visit weeks with 'home' weeks and once the team divided into two groups the two didn't meet face to face for several weeks. Where requests for disk or photo copies might have sufficed in less time- and geography-constrained environments, the trip report creation process pointed out the shortcomings of the multiple non-interconnected information systems

deployed in a large company. Even the use of portable computers for taking notes in the field was constrained by a lack of suitable equipment that was sufficiently portable.[29]

The other areas where the team felt they had the most difficulties were in the processes of summarizing concepts, screening for potential opportunities and generating new business opportunities could be presented to management. The problem in the first part is mainly related to the 'opportunity screening guides' which were used. The team felt uncomfortable with a set of guides that had originally been prepared for the context of telecommunications equipment. Yet they were not able to articulate an alternative set in the heat of the moment and under time pressure. The problem for the team was that they were not sufficiently confident about what it was that their management desired in the area of new product opportunities, so it was hard for them to either accept a suggested set of guidelines or propose some alternatives.

Interviews (April 1993)

In this dissertation, innovation is seen not as an outcome but a process. As such it has to be understood in context. In particular, the time element needs to be understood. The team made recommendations in January of 1992, but what happened to those recommendations? The stated objective of introducing "champions of innovation" technique is to reduce the interval and increase the quality of the innovation process overall. The researcher went back to each of the team members a year later to learn more about how "champions of innovation" fit in with the organization after that amount of time, what impact the recommendations had on the company and on the individuals, and what their overall assessment was of the process.

Analysis

The ABC Tel case examines the early stages of the innovation process in a telecommunications service company through the actions of a "champions of innovation" team. Key questions addressed in this chapter are the portability of the "champions" process to telecommunications services, how it might be enhanced in future iterations, and what are the roadblocks to effective use of this type of an innovation management technique. The author participated as a member of the team. The case reflects his own experience as well as interviews with participants during and after the process. Key results include:

- Innovation teams require some shielding from unrelated issues within the company.
- Innovation teams suffer if effective links to senior management are not in place. Effective is defined as frequent and informal communication.
- The "champions of innovation" technique works in a service context. Significant changes were not required.
- Problems with the technique were linked to the particularities of the organization (attitude toward innovation, culture of innovation) and factors which affect all organizations (travel cutbacks, administrative reorganization, time constraints, hierarchies of control). These are summarized as "box two" problems (if the champions of innovation methodology can be thought of as "box one").
- It is possible to identify, qualify and quantify two significant new business opportunities in the six month time frame allotted to

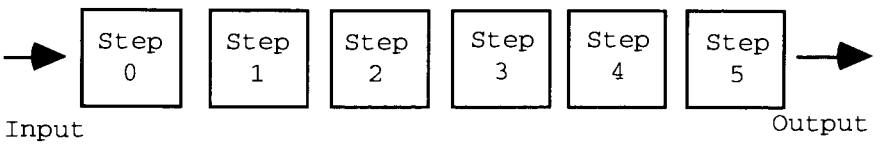
the team. There is some evidence to suggest that this time could be reduced to four months.

- Innovation teams must pay careful attention to the problem of "managing expectations" so that their results are not a disappointment or surprise to those who commission them.
- The chief barrier to using the champions of innovation methodology appears not to be related to the method itself but to the process of handing off new ideas for a development decision. The method does not address this significant issue.

Modeling the formulation process

The results indicate that champions of innovation probe was a rewarding but ultimately frustrating process for the individuals who were involved. The organization put a great deal of effort into the team activities, including the time of the six team members, the travel and operating expenses as well as the time of the acceptor group. The initial list of recommendations did elicit a promise to develop one of them into a formal business plan but this faltered and died a few months later. This experience, combined with the interviews with the team members and others associated with the process led the author to reconsider the model of the formulation process as it was understood until then. As the team began their work, the model of formulation found in "champions of innovation" was largely restricted to the process itself.

Figure 6.1: Formulation model 1



To the extent that it dealt with activities from outside the team these were considered as inputs and outputs and not barriers.

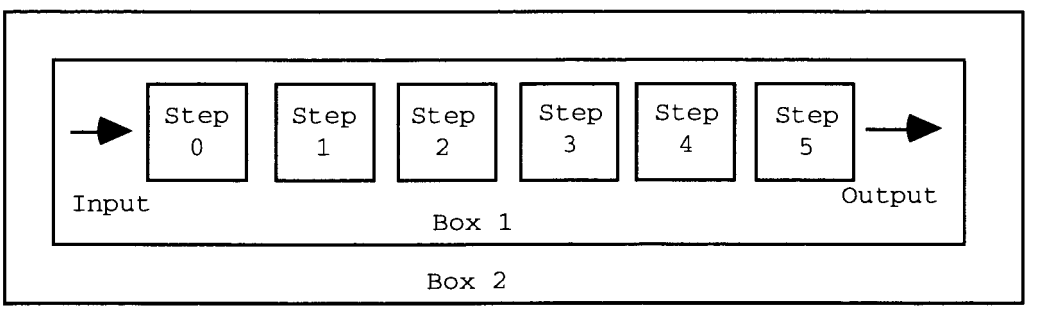
When we plan activities it is reasonable to use some sort of model of the process we anticipate -- it is simply not feasible to work with all the details of reality. A model is like a map, it has to be sufficiently detailed to be useful and not misleading, but not so complicated as to become unwieldy. The model of the formulation process that this research began with was initially based on the stages described in the literature on new product development. These broad outlines were supplemented in the specific instance of "champions of innovation" by the steps as laid down by Bailetti and Guild in their various papers as well as the descriptions of the process the team received during the exploration.

This map, however, did not include some of the problems experienced by the ABC Tel team. Although it is no doubt inevitable that adversity stands in the way of any journey, there was a consistency and pattern to the problems that the team encountered that suggested that an extended model was required. After discussions with team members and experts in the field,[30] the author began to look at the process as two nested boxes, or areas of concern. The first box, or "Box 1", consists of the formulation steps described by the "champions of innovation" method. The second box, "Box 2" surrounds this first box and consists largely of the

outside world as represented by the organization for whom the investigation was being conducted.

The revised model of the formulation process, then, was one with the same steps as understood from champions of innovation, but these steps were enclosed within a larger set of interests and activities that comprised the organization as a whole. (See Figure 6.2).

Figure 6.2: Formulation model 2

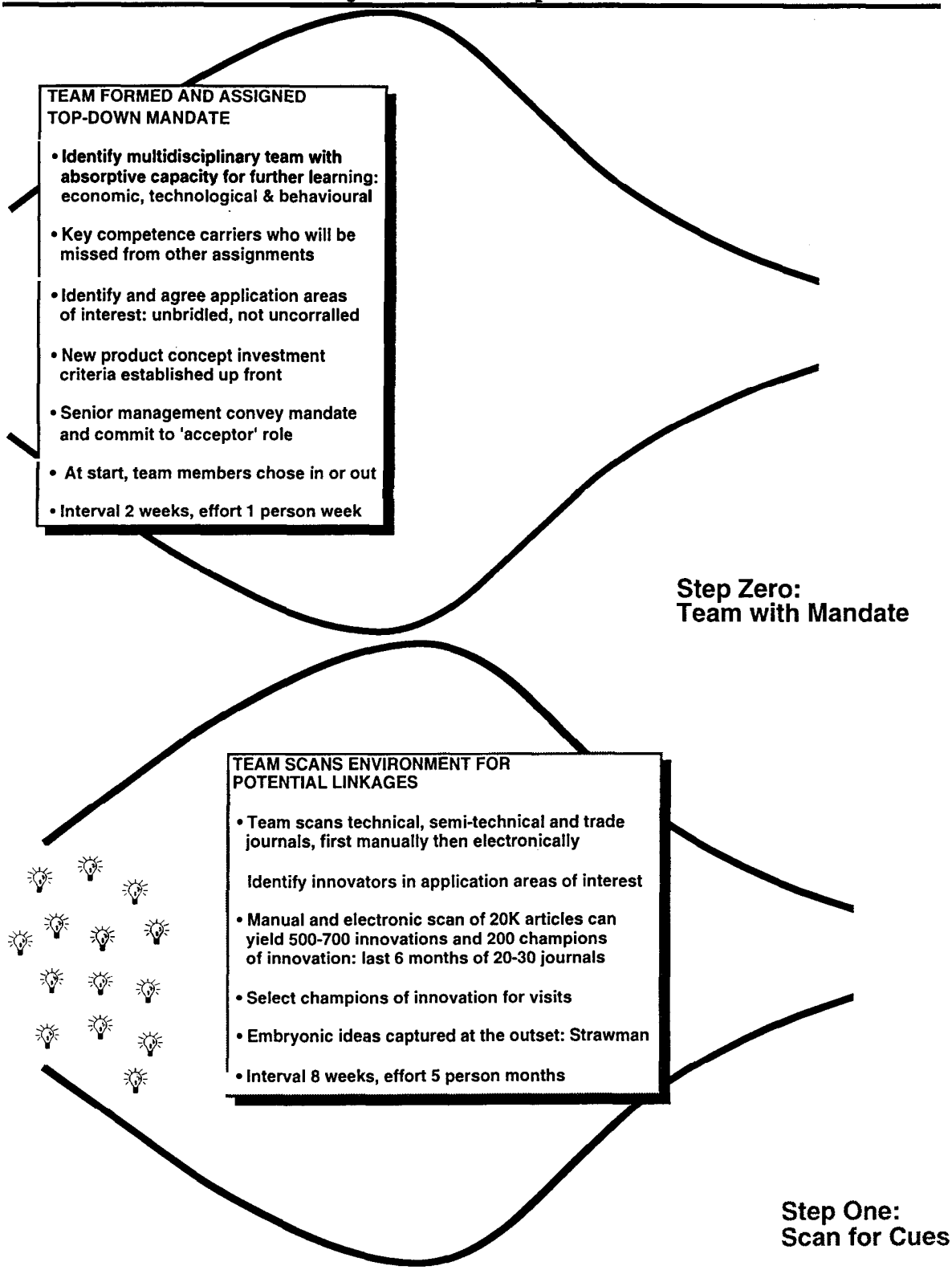


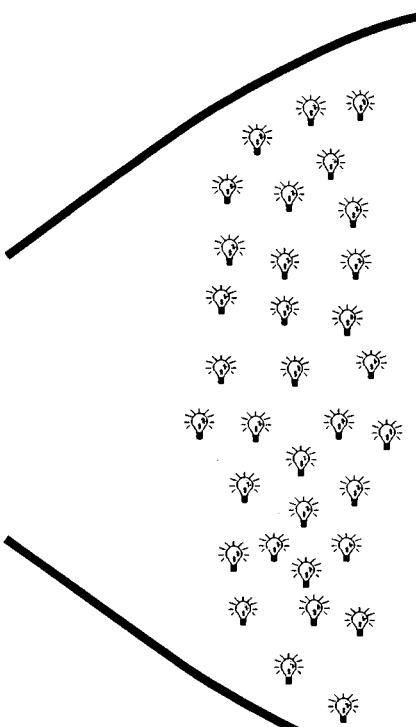
Many of the difficulties the team encountered have their origin in the second box. For example, the reorganization activities originate there, as do company-wide restrictions on travel. More importantly, the final step in the champions of innovation process, the development decision that all the work is in aid of, is located in box two, and not box one. That is, the decisions about new products development was not going to be made by the group who carried out the investigation (the team) or the group who sponsored it (the acceptors).

Once the "champions of innovation" formulation this model was modified to include these boundary management issues, it became obvious that these were problems and situations common to most organizations. Standing in the way of innovation and change in an organization are all

the layers of management that comprise the hierarchical structure and the command and control practices built up within that structure. A review of the literature on organizational behavior and organizational communication confirmed that the phenomenon referred to as "box 2" had been described in the literature on management, mainly in the context of organizational change. New product development, especially if it involves significantly new products and services, is quite likely to include organizational changes as well as technical and marketing changes (Johne & Snelson, 1988). These changes are frequently the source of shifts in power and hence would be resisted by those who might lose influence because of the changes.

Figure 6.3: Steps 0 - 5





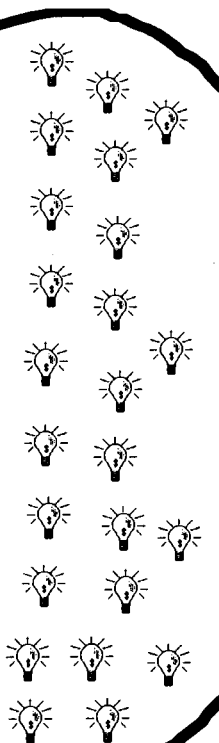
ORGANIZE DIRECT CONTACT BETWEEN TEAM AND INNOVATORS

- Make telephone contact & introductions
- Travel budget: $50K
- From 200 champions 40 field visits requested: high proportion agree
- Conduct visits & two-way exchanges
- Synthesize learning in trip reports and strengthen emerging concepts
- Interval 8 weeks, effort 11 person months

Step Two: Direct Contact

MANAGE TEAM CREATIVITY AFTER EXPOSURE TO INNOVATORS

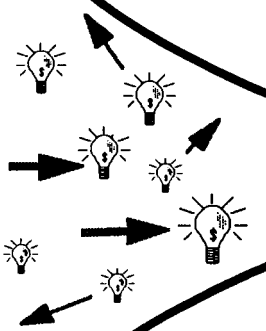
- 1st, individuals provide computer mediated initiation of concepts
- 2nd, non-evaluative brainstorming
- 3rd, critical discussion and prescribed assessment by team
- Generate 20 - 30 concepts which are collectively owned
- Team rank orders according to apparent opportunity
- Interval 1 week, effort 1 person month



Step Three: Group Creativity

OPPORTUNITY SCREENING BY TEAM

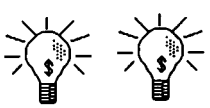
- Scope business attractiveness
  - Screened 7- 8 front runners using Opportunity Screening Guide
- Select most attractive opportunities
  - Established criteria applied
  - Estimate relative opportunities
  - Backcast implications of alternatives
- Interval 1 week, effort 1 person month



Step Four: Screening Concepts

PRODUCT OPPORTUNITIES TABLED WITH ACCEPTORS FOR INVESTMENT DECISION

- Specific formulation team innovations initiated
- Focus on best 1 - 2 opportunities in presentation to senior management for investment decision
- Formal business plan and commercial spec to begin
- Key team members continue into development process
- Formalize external relationships as appropriate
- Interval 4 weeks, effort 6 person months
- Total Interval of 24 weeks and effort of 24 person months



Step Five: Investment Decision

Endnotes

[1] See Rathmell's observation that "new services happen" (Rathmell, 1974) and Langeard *et. al.*'s suggestion that new services happen as a result of intuition, flair and luck (Langeard, et al., 1986).

[2] See Chapter Five for details on formulation.

[3] There is a large literature on this point. Examples include (Calantone & di Benedetto, 1990; de Brentani, 1989; Griffin & Page, 1993; Maidique & Zirger, 1984; Myers & Marquis, 1969; Rothwell, 1977). Note that there is a perspective which regards the 'front end' of innovation as something to be managed 'loosely' and reserve strict controls for the 'back end' (Johne, 1984). Formulation would be categorized as a front end activity.

[4] An exception is a M.Sc. thesis at MIT which looks at the use of von Hippel's lead user method in telecommunications firms. See (Capell, 1989).

[5] The company had an additional agenda. As sponsors of the larger research project they wished to facilitate the transfer of some of the research results to their organization.

[6] Change in the telephone industry until the 1980s was typically a collaborative process between telephone companies, equipment vendors (either owned by or owners of telephone companies), regulators, and international standards bodies (usually made up entirely of representatives of the telephone companies and telecommunications equipment vendors). Rarely did a firm have to look out for its own interests or consider developing products and services unique to its market.

[7] As early as 1985, J. F. Cady and a group from Harvard University were plotting the players in the information technology industry on a two dimensional map of carriage and content. Telephone companies occupied one corner of the map but their business was influenced by all four quadrants. See (Cady, 1985).

[8] Atkinson and Williamson provide a concise history of the arguments used by Bell Canada (and other telephone companies) to ensure that telephone switching equipment should not be subject to competitive bids. See (Atkinson & Coleman, 1989), especially chapter 5.

[9] See (Kraemer, 1992).

[10] While there have been no failures among the "Baby Bells" in the years since the Modified Final Judgment and the break up of AT&T, there have been significant changes. Most have lost market share and one article notes that the *average* job loss at regional telephone companies in the U.S. has been 15,000 employees. See (Kraemer, 1992). The uncertainty is not so much the possibility of failure but recognition

that there will be dramatic change in the operations and style of the phone company.

[11] The Canadian telephone companies have not always been as successful. Considerable overcapacity in the system existed in the 1980s.

[12] It was not always thus. In the early years of telephone service small local firms were the rule rather than the exception and their financial situation was sometimes precarious. There was even a period in which multiple local carriers were operating in centres such as New York City. The economics of the business soon saw these small "mom and pop" telephone companies all but disappear from the industry. Ontario is the only province in Canada with an appreciable number of small telephone companies. See (Canada. Department of Communications, 1992) for a history of telephone service in Canada.

[13] Kraemer provides the following synopsis of the usual thinking behind competition in telecommunications:

- Competition accelerates the introduction of new services and ensures that prices contain no monopoly rent components;
- Technology favors easy entry by well-financed competitors which have no vested interest in, or an asset base composed of, obsolete technology;
- More total capital (foreign and domestic) will be attracted to, and deployed in, a competitive telecommunications market than to a state-funded monopoly carrier;
- The overall quality of life in the society requires a modern, capital intensive telecommunications infrastructure which can best be achieved in an environment in which competitors attempt to achieve sustainable advantage through their network capabilities; and
- Competition will force change upon the dominant carrier -- something a government owner often lacks the will to do through the political process. (Kraemer, 1992:2)

[14] "The telecommunications carriage industry's share of the Gross Domestic Product (GDP), at factor cost and 1986 prices, has grown steadily from 1 percent in 1970 to 1.8 percent in 1980 and 2.7 percent in 1990. In 1990, the industry achieved a growth rate (after inflation) of 8.6 percent, which compares favourably to the 0.3 percent (at factor cost and 1986 prices) attained by the national economy" (Canada. Department of Communications, 1992).

[15] See George Gilder's soon to be published book *Telecosm* for a complete review of this process. Excerpts have been published in *Forbes* magazine and distributed through the Internet (Gilder, 1993a; Gilder,

1993b; Gilder, 1993c). An earlier article appeared in *Harvard Business Review* (Gilder, 1991).

[16] Woodrow and Woodside describe the 'demonstration effect' on Canadian regulators who watched as key court decisions in the United States deregulated terminal equipment markets and long-distance services (Woodrow & Woodside, 1987). See also (Woodrow, 1989).

[17] See (Atkinson & Coleman, 1989) on telecommunications policy in Canada. Atkinson and Coleman note that government attempts to lead the industry have been largely unsuccessful. With reference to the telecommunications equipment industry, Atkinson and Coleman report that the industry has achieved 'unparalleled success' in the post-war era, and "Moreover, it has done so with little help from the state. State agencies have worked on the margin of this sub-sector. Consequently, as Northern Telecom and other firms have moved more and more production abroad, the state has been left singularly unprepared, if not confused by these developments. It lacks a strategy for the treatment of these multinational corporations and hence any capacity to capitalize on the success of these firms." (Atkinson & Coleman, 1989:98)

[18] For more details on the technique and its origins see Chapter 5.

[19] The practice of participatory action research (PAR) is covered in the research methods section below. The origins of PAR and further details are provided in Chapter 4, Methodology.

[20] The notion of an 'acceptor', roughly analogous to the change agents referred to in innovation literature, is an term used in the new product development process in the telephone company. An acceptor group commissions an inquiry or task force and accepts the results.

[21] The high rate of positive response has been replicated in other instances. The issue of why organizations respond so positively was explored by Orla Hegarty of University of Waterloo. Her results suggest that firms participate in this sort of activity out of a desire to gain information.

[22] The word "team" is used throughout this chapter, but in terms of recent literature on team work, such as Katzenbach and Smith's work with high performance teams, they more closely resembled a 'work group' or 'task force' at this stage.

[23] On the face of it, this would seem to be a process fraught with potential for disappointment. On the contrary, team members found it to be exhilarating and rewarding. Although we don't yet have all the reasons why, there has been to date phenomenal rate of acceptance among prospective sites. In this case we had a greater than 90 per cent success rate.

[24] Early on it was recognized that the whole team would not be able to attend all of the visits. The team decided to split itself into two sub-teams and conduct site visits on alternating weeks. The scheduling problems this caused, when certain members wanted to be on certain trips, almost broke the team apart.

[25] This was eventually increased to 23 champions through the addition of some local and internal visits. The local sites provide an inexpensive opportunity to develop the team's skills at extracting the information they need from a "champion of innovation". The internal visits provide the double benefit of giving the team members insight into corporate strengths and direction, something they will need in the later stages of the process.

[26] An important question is raised as a result of this conflict: to what extent does the team begin to see their "enemies" within the company as opposed to in their competitors? This issue will be considered in more detail in the conclusions.

[27] Keen suggests that new business opportunities must be stated in the form of an operational definition: "Videoconferencing", Keen argues, is not an opportunity. "Using telecommunication to improve coordination across distance" is. The important issue is the presence of a verb, an object and a qualifier. Verb: Action to be taken; Object: the target population; Qualifier: the business reason. By forcing people to state opportunities in this form we reduce the possibility for vague or meaningless opportunity statements based on the mere presence of a technology or market.

[28] This concept is treated in more detail in Chapter eight.

[29] Advances in miniaturization and increasing capability of portable computers since the fall of 1991 would most likely make this problem much less vexing today.

[30] Discussions were with Paul Guild, one of the two people who originated the "champions" technique.

Chapter Seven

Study two

This study builds on the work in study one. First, it makes further observations on the execution and results of the technique based on interviews and documentary evidence collected by a non-participating researcher. Then it takes the results of the application of the "champions of innovation" technique in services reported in study one and compares them to an application in equipment manufacturing, using a value chain approach. Finally, the model of the formulation process developed in study one is refined.

Background

It could be argued that the observations and analysis in study one were distorted by the researcher's active participation with the team. The participatory research method was chosen to provide depth and real-time insights into a complex and rapidly changing process. While participation was seen a strength of the method, in order to address some of the concerns about objectivity, as well as explore additional issues, a second study was conducted to allow observations from a more 'detached' observation point. Three research questions were considered. In addition to the questions posed in the first study, which related to the practice of "champions of innovation" and how it can be conducted most effectively, the researcher looked for differences in the application technique that could be attributed to the differences between the final output of the recommendations. This team, although it reported in a similar time frame, for a related business

(telecommunications equipment), and on an almost identical topic, was primarily interested in manufactured goods, not services. Finally, the research sought to elaborate and probe for further evidence which would support or reject the formulation model described in study one.

Another "champions of innovation" team, in an unrelated company, was identified and persuaded to participate in the research. The organization which sponsored the team was DEF Research, the R&D arm of a large telecommunications equipment manufacturer. Although the author did not know any of the team members personally and did not at the outset have a link to the organization, access to what would otherwise have been internal classified materials was obtained through the signing of a non-disclosure agreement. For this reason, the names of individuals and organizations reported in this case have been disguised.

Research Questions

Three research questions inspired the present study. The first question is identical to the question which prompted the first study and is the concern of the entire dissertation: "how can multi-functional teams acquire, process, and present information in order to enhance concept formulation in telecommunications services organizations?" The rationale and objectives of this aspect of the research need not be repeated here.

The second question is: "what are the differences between formulation techniques for manufactured goods and services?" The literature on service management suggests that these two are handled quite differently at the development and deployment stages. It is reasonable to assume that there would be differences at the formulation stage as well.

Differences between products and services in the economics, marketing and management of technology literature were described in chapter one. These differences suggest areas for investigation in this exploratory work.

The third question is: "how can the experience of an additional team contribute to the refinement of a model of the formulation process?"

Data collection

Data were collected in telephone interviews, questionnaires, and documentary evidence. The telephone interviews were semi-structured, based on an outline of questions prepared beforehand. The questionnaires were sent to each of the respondents following the interview, either by fax or electronic mail, and they were returned in the same way. Documentary evidence included samples of the material the team collected, some of the internal documentation the team used in preparing their report as well as examples of the presentations the team produced describing their findings. Documentary evidence was collected from a manager who worked with the team and a team leader.

The interviews took place by telephone during July of 1993. The DEF Research team members had all participated in at least one "champions of innovation" process[1] and a few had been on two or three. The interviews started out with one team whose activities and topic area had paralleled the ABC Tel team. Using contacts within that team the author was able to also interview to several other people from other teams within DEF Research. The process is on-going within DEF Research, and new teams are created from time to time as need requires, although the method has

loosened considerably from the rigorous description used in the initial probes.[2]

Results

Results are presented in three sections. The first section reports on the application and use of the technique as described in questionnaires and interviews. The second section takes a 'value chain' approach and compares the activities of the services oriented champions of innovation team from study one with the equipment oriented champions of innovation team in the present study. The third section provides further discussion and refinement of the formulation model introduced in study one.

Champions of innovation technique as applied to telecommunications equipment

Questionnaire Results

Respondents were asked to indicate their confidence in a series of statements, and code their response on a scale ranging from 1 (not at all confident) to 7 (extremely confident). There were three parts to the questionnaire. The first part asked the respondent three questions relating to the recommendations and overall use of the technique. The second part asked about the team's collection of information relating to innovation drivers. The third part was more exploratory and sought to probe several areas of inquiry based on a literature review of new product development and innovation as well as the earlier interviews with the ABC Tel team.

The results from part one of the questionnaire revealed that the DEF team members were not very confident of their organization's ability to act upon the results of a probe. They were "in between" on whether the

team had achieved its objectives and only slightly more confident that the technique could be used effectively within the organization.

A summary of the responses to the first three questions is presented in the table below:

Table 7.1: The Results of the Method I

Question[3]	Avg.	N	Max.	Min.	Med.	Var.
1. How confident are you that the task force achieved its overall objectives of identifying new service and product opportunities for DEF related to 'imaging'?	4	6	6	2	4.5	2.8
2. How confident are you that the 'champions of innovation' method can be used effectively by DEF for the purpose of merging exploratory technical research breakthroughs with potential market applications?	4.83	6	6	2	5.5	2.57
3. How confident are you that DEF will be able to act upon the task force's recommendations related to 'imaging' service or product opportunities?	2.33	6	4	1	2	1.07

The fourth through ninth questions asked the team member's confidence that various innovation drivers had been identified. Results for these questions are presented in a table below:

Table 7.2: The Results of the Method II

Question[4]	Avg.	N	Max.	Min.	Med.	Var.
4. How confident are you that the task force identified the most significant trends in 'imaging' related to changing customer needs?	5.17	6	6	3	5.5	1.37
5. How confident are you that the task force identified the most significant trends in 'imaging' related to technology breakthroughs?	4.17	6	6	2	5.5	2.57
6. How confident are you that the task force identified the most significant trends in 'imaging' related to technology market timing?	3.83	6	6	2	3.5	2.17
7. How confident are you that the task force identified the most significant trends in 'imaging' related to new competitive environments?	4.00	6	6	2	4	3.20
8. How confident are you that the task force identified the most significant trends in 'imaging' related to changing regulations?	2.67	6	4	2	2	1.07
9. How confident are you that the task force identified the most significant trends in 'imaging' related to emerging standards?	4.60	5	6	2	5	2.80

As in the ABC Tel case, team members were somewhat more confident in the ability of the technique to provide information relating to market-related innovation drivers than they were in their organization's ability to act on that information. On the other innovation drivers the picture is less clear. Four of the questions (numbers 5,6,7, and 9) produced averages that were in the centre of the scale but had a high degree of variance. In other words, there was disagreement about these questions. With only six data points it is difficult to draw conclusions but it should be pointed out that the data is more bi-modal than modal.

In the area of regulation, as with the ABC Tel team, there was general agreement that the technique was not useful in this regard.[5]

The next part of the questionnaire was a list of thirteen statements about the innovation process at DEF Research. The respondents were asked to indicate the extent to which they agreed with the statements, based on a scale of 1 (strongly agree) to 7 (strongly disagree). The statements reflected different dimensions of 'best practice' in innovation or problem areas that had been identified in the interviews. A list of the questions is provided in Table 7.3, below.

Table 7.3: The Results of the Method III

Question[6]	Avg.	N	Max.	Min.	Med.	Var.
Most people know the steps to get an opportunity approved and an investment made.	3.50	6	7	1	3	5.10
It is easy to come up with ideas for new business opportunities.	3.67	6	6	2	4	2.27
We have many more innovative business opportunities than resources to pursue them.	3	6	7	1	2.50	4.40
We need a new approach to generating new business opportunities.	2.67	6	7	1	2	5.07
Senior management is well informed at every stage of an innovation team's progress.	4.83	6	6	3	5	1.37
Senior management is clear in its directions to innovation teams.	5.67	6	7	4	6	1.07
Senior management is challenging but reasonable in their expectations of innovation teams.	4	6	5	3	4	.80
A good manager of a innovative opportunity is one who can circumvent the bureaucracy.	2.17	6	4	1	2	1.37
We need new ways of ensuring good ideas reach those who have the ability to act on them.	1.33	6	2	1	1	.27
Our employees are not motivated to be innovative.	3.67	6	7	2	3	3.87
Our management is committed to the innovation process.	5.17	6	6	5	5	.17
Our innovative people lack access to internal information	4	6	7	2	3.5	3.20
Our innovative people have good access to external information.	3.5	6	6	1	3.5	3.5

The objective in posing these questions was two-fold. First, to get a quantitative assessment of the opinions of DEF Research team members on

aspects of the innovation process, as a supplement to the interviews. Second, to help refine the questionnaire for eventual use on a larger sample.

The results suggest that there is dissatisfaction with the innovation process overall, particularly in terms of the results reaching those who can act.[7] Two questions that probed this dimension are those which ask about circumventing the process and information reaching those who can act on it. There was general agreement that these were both desirable, perhaps indicating a feeling that those who circumvent the process are doing so to ensure that those who can act on results do hear about them.[8] Two other areas where responding team members were consistent in their responses and strong in their opinions are the extent to which management is committed to the innovation process and clear in their directions to teams. The common feature of all the questions that resulted in some sort of an overall answer that was not just in the middle of the scale was that they were related 'box two' issues. The directions from management, the extent to which management is committed to the process, the concern that ideas do not reach those who can act on them, even the support for those who would circumvent the process all indicate a dissatisfaction with the "box two" part of the process.[9]

Questions which probe the steps inside the lead user technique itself, such as access to internal and external information, issues with regard to motivation, access to resources, ability to generate ideas, and familiarity with the steps, all elicited 'neither agree/nor disagree' kind of responses -- i.e., close to four.

Interview Results

The interviews resulted in information on two dimensions -- the lead user/champions of innovation technique itself, and the environment for that technique. Despite the criticism they made of the process, the interviewed team members were all positively affected by that process and made their comments and suggestions in a spirit of improving it so that it could work better in the future. It was not difficult to get them to speak of the benefits of the lead user technique, for example.

One of the most important benefits of participating in a process like this, from the perspective of the participants, was the individual learning that resulted. Some of the team members were unfamiliar with customer interaction and were strongly motivated by the opportunity to "get their heads up from everyday concerns." It was an opportunity, according to one, to be exposed to information that is usually only available to executives -- the customer's needs. The benefit of seeing the energy of customers was also mentioned. Another respondent spoke of the training that resulted from being involved in the process and mentioned that it was an experience that he refers back to frequently. For some, it was felt to have been something which positively affected the direction of their career.

Teamwork was another common theme. Group skills were enhanced by participating in the process, including being able to appreciate the contributions of others. On the negative side, some respondents reported that their work group was not particularly interested in the results of the probe and therefore that team member was reluctant to participate as much as they otherwise might have. Others did participate fully but also had the interests of their home department in mind when doing so.

In addition to the benefits in terms of individual learning and teamwork, some other observations came out of the interviews. As in the questionnaire, team members were asked about their team's performance in terms of ability to quality and quantify the opportunities. As one team member pointed out, quantifying the opportunities was not part of the mandate and they didn't even try to do that. They did, however, do a very good job at identifying opportunities, he felt [HB].[10] The technique was especially well suited to identifying opportunities in the area of emerging customer needs. Talking to "the people who will really be using the products" was observed to be the greatest value in being able to assess the market drivers to innovation. Compared to the usual techniques that the team was familiar with (focus groups, surveys), this technique "provides a better mechanism to be able to understand time frames" [HB]. Time frames, or timing -- when a product or service is likely to be acceptable, possible and profitable -- is a key element in this process. One team member spoke of the necessity that the "internal clock" of the firm must be synchronized with the external clock of the market [MP]. This "clock" is the fertile ground that is necessary for an innovation. It is not sufficient, according to this argument, to have good ideas -- they must be acceptable to the market in the form of satisfying a need at an acceptable price and acceptable to the organization in terms of delivering a market at an acceptable profit. Another spoke of the importance of having a champion within the organization -- someone who was sufficiently dedicated to the idea to carry it over the inevitable hurdles. The suggestion was also made that this champions should be someone "sufficiently high up that they can make a difference." [MC]

> HB did the analysis, wrote the report. He was in charge. He also sold the ideas. From that perspective he was a champion. He carried it all the way through. If HB can't sell an idea then something is wrong. He's great about that. It must be something else. Obviously people just didn't want to buy . HB knows how to make sure that the right people hear about it.[11] It wasn't a lack of political sense. Possibly because he was alone. Also, it was very difficult to sell that topic in the company at the time. Some of the people on the project -- for example -- had to give up on it shortly thereafter and move into another field. So there was a broad based lack of support. The climate was wrong. Now, HB could sell his ideas. Ironically, it is too late now for the company to take advantage of them. The window of opportunity has passed. [RT]
>
> Something like the lead user method is important for any company. Only difference is in terms of the enthusiasm for the results. That is dependent upon the size and type of company you are in and the current situation. If things are going great guns (next generation is in place, funding is stable) then people won't necessarily be interested in this sort of information. As opposed to a company that is in crisis where they are desperate for information. I would hate to think that the technique is only useful for a company in crisis, although they may be more acceptable in that environment. A good thing to ask then is how can we tie the results of this process into new product development without a crisis? [RL]

The notion of acceptability implied in the above statement is based on some form of free competition and more or less free or perfect information. Markets outside the firm are not free and information dissemination is not perfect, however. We might assume they are close to those ideals, for the purposes of the argument but we always need to be aware that that is an assumption. The team members are, with their comments about the necessity of having a 'champion' or internal clocks, implicitly acknowledging the imperfect market for ideas that exists within an organization. When a new idea emerges, a new business opportunity is identified, it does not face a neutral test of acceptability. Even if we leave aside the very real possibility of decision makers who reject an idea because it challenges their own assumptions about the business, the market, or the technology or

challenges their situation within the company, we have to be aware of the problems a new idea has in getting an audience within an organization. Over the past few years we have seen a rapid decline in the viability and numbers of 'command and control' economies all over the world. This trend has been accompanied by a great deal of commentary on how those forms of economic organization were no longer able to satisfy desires or meet expectations in a rapidly changing world.

Despite the best efforts of people in the business of consulting on the topic of new product development, many of the people contacted for this research did not know how ideas moved from being inventions to being ideas. That is, they were unclear how their company developed new products. Not only were they unclear how it 'really' works, but they were unclear how it was supposed to work. This is not to say that plans did not exist, but that they had not been widely disseminated.

A research technique like this, according to [MP], is useful because it creates knowledge instead of information. Information they have a lot of -- it is knowledge that it is difficult to come by, and direct contact is one way of turning information into knowledge, because it provides the context for the information.

Several team members had been on previous 'lead user' probes and a couple had also participated on one which followed the one being tracked. According to those who had been on more than one probe, the process was getting better and better. According to [MC], "the process wasn't at fault, if the results weren't felt [in the company]." Another person who had been on multiple probes, [MP] claimed "the lead user technique is better each time."

Part of the improvement appears to be related to reducing the cost and involving a wider group of people. In a very recent probe the organizers were able to manage a team from several sites, through extensive use of voice mail, electronic (computer) mail, audio and video conferencing as well as memos and reports. This use of asynchronous communication resulted in a far lower budget and participation from people in labs in three North American cities.

The team members were not shy to point out deficiencies in the process. The criticism was well-intentioned, however, and all of the respondents saw value in the technique -- despite problems in the execution.

For some of the respondents, including [HB] the manager of one of the probes, the process by which a probe is initiated is something of a mystery. When they are initiated the mandate isn't always clear in terms of who is responsible for the results, who will "run with" them. [RT]

> DEF is not "too big" to take advantage of lead user probes. The problem is they're not organized to spawn new business activities. Before you can spring a single development dollar at DEF Research you've got to get a champion, a formal program, and the product management group of an established product line has to support it. And if the scope of the business opportunity does not fall within the existing business infrastructure of that product line then it is very difficult if not impossible to proceed. [MJ]

One of the ways champions of innovation organizers have tried to integrate their activities into the larger organization is to have a group who would be the 'acceptors' of the results. It would appear that the team members do not have as clear a view of who these people are as do those who are organizing the team. One respondent mentioned that he had little interaction with the acceptors [PD], another mentioned that the prime champion within the company lost interest in the probe and as a result the report was not made. As one team member put it: "You have

to have that mandate that something will happen with the recommendations. The commitment to come up with a new service or a new product before you start. The acceptors should commit themselves to 'buy' at least the best recommendation. In my experience there was not commitment from the top." [RT][12]

On the topic of site visits, one person complained that there were not enough visits, that the number didn't constitute a sample [RG]. Some thought that the 30 or so sites visited constituted an acceptable 'sample'. Both comments reflect a common misunderstanding of the "champions" technique works.[13] No sampling was intended in the choice of sites visited and therefore this is neither a strength nor a weakness of the method.

After meeting with champions of innovation, the team members were expected to produce trip reports. These were often neglected in the rush of the moment and two team members wished that they could have been more detailed [PD,RT]. In circumstances where not everybody is able to visit a site, the trip reports assume new importance and one team member suggested that the trip reports not be as filtered as has been the case:

> You hear very limited information back from the other 'visiting teams'. It tends to be very processed information. There are two sides of having a richer flow of contextual information about the site visit. The first is so that non-visiting team members can come to the same conclusions as visiting team members. The other side is so that non-visiting members might come to different conclusions, i.e., be able to make an incremental contribution [RT].

After team members have returned from the field and absorbed the trip reports, they are asked to participate in some brainstorming sessions. These sessions were sometimes hampered by the number of people involved, according to one team member who recalls a brainstorming session with 30 people in attendance. This appears to be less a problem of the method

itself and more a case of failure to pay attention to the guidelines in the method and associated techniques. The literature on brainstorming suggests that small groups are a better approach in these circumstances.

Another brainstorming issue was linked to the problem of trip reports having different importance and meaning for visiting and non-visiting team members. As one member put it:

> "People weren't very good at integrating the ideas from the other teams into their own ideas based on their own experiences. The strength of the information they got from their own team overpowered the information they got from the others. People became excited about the places that they visited.[14] If they had some more visuals then they might have been able to make the link between the sites." [RT] Another problem was simply the amount of time allocated to brainstorming.

Once the brainstorming was complete, the team identified opportunities, fleshed them out and made a presentation. They also submitted a final report. One of the team members couldn't recall doing a final report. [PD] Another remembered only the presentation and felt that while a presentation is important it is also important to have something that people can refer back to. [RT] The issue of the final report brought up another concern, namely the amount of resources dedicated to interpreting the information. A great deal of information is collected during the direct contact with innovators, but the team at DEF recalled spending a day on the overheads and trip report and a day on pulling the presentation together. The trip reports and presentation/final report were not "owned" by all of the team members, apparently. The subject matter experts, drawn in for their input in the process, did not feel it was their responsibility to promote the final result. The team was comprised mainly of these sorts of experts who went along for the trips or contributed to the process in various ways but did not act as a team throughout and at the end were willing to let the

project die. This is in contrast to the way things were organized in ABC Tel a year later and may reflect some refinement of the technique. The lesson, if it is one, was not taken to heart by DEF, however. A later probe on multimedia involved an even larger number of people who met as a group even less often and essentially existed without a 'core' group at all. The two organizers of the probe were the only ones 'on the line' for the results in the end[RL,WT]. Many of these "problems" argue for a formalized and disciplined approach to the application of champions of innovation that is adhered to.

Most of the team members at DEF have seen the process evolve over the past four years. While they are enthusiastic about participating and confident that the results they obtained were worthwhile, most did not believe that the organization was able to take advantage of the opportunities that were identified. At least not in the way that the technique anticipates that they will.

A perfect example of this is related to point of sale (POS) devices to be developed as an add-on feature for the organization's line of small private switching unit equipment. With the sales of that equipment doing well but nothing in sight to bring onto the market after it, a team of designers at DEF went out to explore new business opportunities. This was actually the first instance of the lead user technique at DEF, and the method was still evolving at this point. Nevertheless, they came back with a recommendation to develop equipment which would integrate with their switching system and provide a platform for POS equipment (credit card readers, inventory management, bar code scanners, that sort of thing). The team had observed explosive growth in this area and the fact that current owners of DEF's switches systems were having to

install separate telephone lines to support off-the-shelf credit card validation equipment, since it was not compatible with the switch. When these recommendations were presented to the division management, however, they were not interested and the development was not pursued. As it turned out, however, the ideas were viable but it took a long time for the people who would be accepting those ideas to be ready for them. One year later they contacted the team leader, very concerned to re-assemble the results of the probe because they were interested in point-of-sale devices. The point here is that market timing and organizational timing are not always in synchronization. While a formulation team becomes more aware of market timing, the process does relatively little to discern organizational timing. The final presentation is often a team's only opportunity to affect organizational timing and in large organizations things just don't move that quickly.

This story of an idea which could not be pursued because the company was not ready for it was also repeated in different forms by other teams interviewed. In this, as in other instances, once the company was ready to make a decision then the recommendation and the information detailing the opportunity becomes important. It seems as if the technique is able to assist in determining the decisions the organizations should make and the time when they should make them but does not deliver a useful assessment of the decisions the company is *ready* to make.

One of the configuration decisions in creating this technique was not to focus inwardly but rather to look out at the market and the technology. Alternative techniques focus inward for new product ideas, attempting to create products that emerge from existing product lines (line extensions) or sales projections (market surveys). An external

perspective is a worthy objective but it may not leave the team with an adequate assessment of what will be the likely outcome of their recommendations.

The "champions of innovation" technique considers the possibility that the team may in fact have to initiate some change within the organization to have their recommendations followed. Three aspects of the technique foster this awareness: First, there is an explicit understanding that direct contact will trigger "action thresholds" -- the level of awareness or pressure required to generate a response -- across a broad range of functions. Second, the team members are selected from a variety of functional departments with the hope that they will participate in follow-up initiatives in their own departments. Third, the presence of the "acceptor" group is a recognition that management has to be involved in the ultimate decision.

One problem identified in this and the previous case was the extent to which the acceptor group have been delegated from too low in the organization. This is possibly related to the perception that the probe teams are equivalent to a task force or other information gathering device in a traditional organization. They have not, despite some partial nods in the direction of action, been configured as action devices in the same way that total quality management (TQM) or business process re-engineering (BPR) teams have been. In the cases of the latter there are many of the same features -- team orientation, exposure to external sources of information, brainstorming -- but on top of that there is layered the strong commitment from top management to the change process itself.

When people create TQM or BPR teams they know that the results are going to ruffle feathers so they give them links to the executive layer of management. The mistake of innovation teams appears to be in the assumption that innovation is uniformly regarded as a good thing, that no one will see it as a threat and the results will be incorporated because they are good for the company. A secondary issue is the level of uncertainty people are willing to allow in their decision-making processes. For many larger organizations, especially those in the telecommunications industry which has lived with a large degree of regulation and/or close relations with customers for many years, the decision-making process is very far removed from the level of uncertainty that is inherent in the kind of significantly new products turned up by this technique. In an organization which does not reward risk-taking and has an entire management structure built around avoidance of risk, the recommendation to pursue a risky venture is simply not a good recommendation to make.

Because returns in the monopoly telephone companies are regulated, even a risky venture that pays off may not be rewarded because the company will not be able to capture those incremental revenues and will not make the effort to compensate the originator. In other words, there is little harm in not doing anything. On the issue of how to improve champions of innovation, it is important to think about the extent to which an innovative new product or service will change a company and therefore how that change will be resisted by those who might be affected by the change.

Whatever the reasons for not following up with a development decision, the process is often opaque to team members. The extent to which this is the case is apparent in this quote from [HB]:

> How are things decided? I don't know: over the past decade I have failed to understand the decision-making process within DEF. (how it is decided, who decides, on what basis things are decided) as to whether to pursue any given market or not.

He was worked in the company 11 years and he says while he is not 'enormously senior' he has worked in a number of areas and at times he felt he understood how things worked but in truth it remains "a major enigma." He went on to state "I really, really, really don't understand how things get off the ground here at all. I think that it is an extraordinary weakness of the company." He doesn't deny that a decision-making process exists, just that he doesn't know what it is. Moreover, he believes that everyone at his level and the next level up feel the same way (he is a second level manager).

As an example of this problem he related the situation of ISDN (Integrated Services Digital Network) in the past year. He and his management spent two years promoting a product and finished up with nothing. The marketing people liked it, and the VP in their parent company for Canadian Marketing announced a product but no one in DEF or the parent company's product groups was willing to fund the activity. So there was an anomalous situation in which product management and marketing were headed in different directions. HB admits that things can "fall off the bottom" in terms of priorities but he couldn't tell how those decisions were being made

Another team member [MC] shared an opinion that it was clear to him that there would be no fruitful outcome from the process. He attributed this to the lack of executive commitment. [MP] felt that the information

was not getting to the people who can make decisions, and that right from the outset there should have been an executive who would commit themselves to follow the recommendations. He claimed that "if you were to conduct a survey of the 'cabinet level' executives in the parent company you would find that none of them have heard of this [the team's recommendations]."

Part of the problem appears to be related to the extent to which team members who participate in the champions of innovation process develop a heightened entrepreneurial commitment, beyond what they would normally hold. Their expectations of action and success are exaggerated by their exposure to the champions of innovation they meet in the field. While this is a beneficial and even expected outcome it poses problems for the team when they return to their own organization and wait for things to happen.

Although teams undertake the champions process to identify opportunities, the organization benefits directly only when development decisions are made. According to [MJ] "nothing has resulted" of the probes he participated in. [HB] stated "nothing useful came of it for DEF" and [MP] "never saw any benefits -- at least tangible ones -- for [our parent company] from the probes." Indirectly, some of the ideas have emerged as part of designers' suggestions for other products, but as [RT] points out, "to be able to get a product directly out of that activity, something else has to happen." What could that "something else" be? Were these team members objective, truthful, and in a position to observe?

The something else may be the senior managers who are involved. The present research does not include sufficient evidence on this point, but

at least two informants pointed to the role of the "champions of champions of innovation". That is, the people who initiated the process (not the probe topic) and who ensured it was followed carefully and completely, including effective and forceful presentations to senior management. According to one account, the senior managers in charge of the champions initiative at DEF research were able to use their considerable personal influence to ensure that team recommendations were carried forward to the highest levels. Their personal involvement in the entire process ensured the team and the team's sponsors had congruent opinions about what had been seen and what it meant. Later implementations of the technique, including the ones reported here, were more independent of the "champions of champions". In the absence of such a champion, it appears that the teams were not as effective as otherwise. This points to the importance of effective management of any organizational activity -- especially those which involve the participants in a considerable degree of uncertainty. The "champions of innovation" process does not obviate that necessity, and in some respects forces the issue of strong leadership by deliberately exposing a large group of people to views from outside the company.

Champions of innovation also highlights the differences between senior management and an innovation team. While the team is focused on the best opportunity in their area of concern, the senior management will be dealing with a larger set of issues, many of which have little or nothing to do with innovation. Strategic decisions relating to cost cutting (as was felt by the ABC Tel team's travel restrictions) or product mandates (the rejection of ISDN equipment) must be made based on a host of factors largely imperceptible to the team. Similarly, the team

makes choices and decisions based on direct contact with innovators, a comprehensive scan of issues and intensive interpersonal and creative activities that are opaque to the recipient of a overhead projector-based presentation.

Again, because the technique illustrates these kinds of problems is not so much a limitation of "champions of innovation" as it is an opportunity by management and team members to identify where the gaps exist between each others' decision processes and work to overcome them. The dissatisfaction described above is not so much an example of untruthfulness, or bias, but rather an illustration of the differences in perspective between management and designers.

Bailetti and Guild describe the champions of innovation process as being very effective in terms of its ability to collect and digest information and turn that information into business opportunity statements. The experience of the team members who have participated in probes since the inquiry examined by Bailetti and Guild, confirms that the technique is effective in those terms. Designers appreciate and welcome the results and the activity. If there were shortcomings it was in the lack of attention to the teams' recommendations. The designers were uniform in pointing to larger organizational issues as being responsible for that problem. They were then asked where they saw the problems beyond the technique and how they would remedy those problems.

The lack of action from executive was in some cases attributed to the lack of linkages between the team and the organization as a whole, despite the 'acceptor' model. One team member questioned the whole structure of the corporation and suggested that an R&D operation separated from production and marketing is not a good idea.[15] Moreover,

[RG] considers a link between management and a technique like this difficult to establish in any case, partly because it is such a large company and it is difficult to know who in that organization is the best 'home' for the innovation. Two team members felt that the infrastructure did not exist to move from idea to innovation, that the company was not well organized to launch significantly new products: "having a lead user probe all by itself, in isolation of a proper infrastructure mandated to respond to the results, is totally ineffective… It's not that we don't get into new business areas because of a lack of ideas, we don't get into new business areas because of a lack of an infrastructure that supports them." [MJ]

This concern for infrastructure was echoed by [GS and MJ] who pointed out the problems of launching a product that didn't fit into the existing sales and distribution channels -- "the fundamental issue is how the parent company does business, and lead user doesn't solve that." [GS] When the company has been willing to look at changing the way it does business as well as the technology it sells, the results have been significant, according to [GS]. An interesting case of this can be found in the development of an inexpensive small business switching system or "key system" developed by the company in the 1980s. Although this activity pre-dated the lead user technique as currently practiced, it did involve teams and a significant new business opportunity. Two teams explored opportunities and developed solutions. One focused on the technology but the other focused on business practice. The technology team came up with a good product but the business team came up with an entirely new way (for them) of selling and distributing office telephone systems. The result was a strong new product and an initiative that

people in DEF hold up as an example of how things should be done. For [GS] the lesson that should be learned from that experience is to be willing to change the business model as well as the technology.

The way the company does business was also mentioned by [MJ], who noted that a new business culture that appreciated "New Business" was needed. This led to the following observation:

> The fundamental problem is that a lead user probe is a tool. It can be an effective tool or an ineffective tool depending on how it is used and managed and so on. But if it is a tool that is irrelevant to the business infrastructure of the company then no matter how good a tool it is it won't be able to produce results. The fundamental problem is not at the conceptual level of the lead user probe but whether you have the right kind of environment for that to have half a chance of succeeding. [MJ]

One of the people who organized a champions of innovation probe, [HB], wondered why the process which surrounds new product development is not more clearly delineated. As far as he is concerned, the process itself is invisible and therefore it is difficult to know what "buttons to press." He would like the process to have more visibility and there be more access.

One of the goals of a champions process is to take activities that innovative workers do in their regular work (scanning the environment, making contact with others inside and outside the company, thinking up new business opportunities) and applying them in a systematic fashion. Part of the mechanism to do that is documenting the activity and formalizing it to a certain extent. The informants from DEF Research agreed that this was a worthwhile experience and more productive than doing such things alone or in an unorganized fashion. It would appear, from the confusion about the activities which precede and follow a champions probe, that team members would appreciate some of the same treatment being applied to the other aspects of the innovation process

in their organization. Such an activity need not be considered part of the formulation technique per *se* but the presence of a manual or description of the overall innovation process would be not just a welcome addition to the team but would, in all likelihood, be a useful tool for any organization.

Comparisons in a value chain

A comparison between the two teams can be made in terms of their different attention to outside firms depending on the champions location on a "value chain". A comparison based on analysis of value chains was chosen in order to provide the researcher with a analytical technique congruent with the innovation technique being studied. To understand why the concept of a value chain helps here, it is necessary to understand what a value chain is.

Value chain analysis was initially described by Michael Porter (Porter, 1985) as part of work on competitive strategies. The value chain approach attempts to provide a graphic description of the links "up" the chain to the raw material and "down" the chain to satisfied customers. In Porter's original version of the concept, product and service value chains were presented separately, usually as the chain for a product within a firm. More recently, we have seen descriptions of extended value chains which links products and services into a continuum. Given the extent to which even manufacturing businesses are concerned with services in order to deliver their products (Chase & Garvin, 1989; Gershuny, 1978; Quinn, Doorley, & Paquette, 1990) these types of integrated value chains begin to make considerably more sense.[16] Quinn's recent work suggests that rather than looking at

multiple value chains for goods and services in related industries, such as we find in telecommunications equipment and carriage, there is instead a single value chain, with tangible and intangible elements (Quinn, et al., 1990).

If Quinn's suggestion of a single value chain is reasonable, then value chains for firms in related businesses, regardless of their 'place' in the chain, are comparable. From the perspective of innovation management, it would he helpful to know where a team believes the best outside sources of information lie -- downstream or upstream? Thirty formulation contacts from each of two "champions of innovation" teams in the telecommunications industry were compared using a value chain analysis. Both had a similar topic for research and both were working in a similar time-frame.

Following the "champions of innovation" process described above, each group assembled, analyzed, and sorted an enormous amount of background information from industry, scientific, and popular journals as well as commissioned several on-line electronic database searches. Both teams were seeking to identify emerging trends in a dynamic fast-paced sector and had similar topic mandates. Both teams selected "champions" they hoped to visit and created a 'strawman' document for use in the field. Interviews with both teams indicated that they felt the face-to-face method of collecting information on emerging trends was a valuable and unique technique. The researcher sought to determine how they approached this opportunity and what kinds of "champions" they selected, according to a "value chain" analysis. The unit of analysis was the site visit.

The data consisted of the ABC Tel team and the DEF research team (here we will call them the service ("S") team and the product ("P")

team), and a list of sites of visited. In order to analyze these data the author first had to classify the teams according to their position on the value chain. A partial control for bias in the assignment of categories was achieved through consultation with one external expert in the field. Using a modification of earlier Harvard descriptions of the information technology industry (see (McLaughlin & Birinyi, 1980), cited by (Cady, 1985)), the author developed the following description of the telecommunications value chain:

Table 7.4: Telecommunications value chain

1 Scientific & Pure Technology Base	2 Applied Technology Providers	3 Product Development and Mfg	4 Service Enablers	5 Service Providers
-compression algorithms - digital signal processing - invention and discovery - universities	video compression hardware companies - PictureTel, Compression Labs	telephone switches and terminals - Northern Telecom, Motorola	tele-communications services BC Tel	healthcare, financial services - hospitals - banks

The "P" team was placed at level 3 in the chain and the "S" team at level 4. The question then became: where would they choose to go for their learning about emerging trends? Would they go "upstream" or "downstream"?. Both teams were essentially unrestricted in their choice of sites. In fact, one of the teams had been requested to make some 'local' visits to make a good impression on large customers but refused.

The "P" team visited 26 sites, the "S" team 33. In order to categorize them according to where they fit on the value chain, the author asked ourselves this question: is the output of this firm closer to the customer (downstream) or further away (upstream) than that of the team? In the case of equivalent firms, they were classified as parallel.

In the case of diversified firms the author focused on the output of the site visited. The task of categorizing the visit sites was done by the author. The visited sites were placed into a contingency table (see Table 7.5). Observed values are on the first line, expected values are in parentheses on the second line.

Table 7.5: Comparison of sites visited

Team	Upstream	Parallel	Downstream	Total
S	15	2	16	33
	(11.19)	(1.19)	(21)	
P	5	0	21	26
	(8.81)	(.881)	(16)	
Total	20	2	37	59

With two degrees of freedom, this table is significant at the .05 level with a chi-square score of 5.991. The actual score is 6.943, indicating a significant difference between the activities of the "S" and "P" teams.

The service team, the team that was closer to the customer in the value chain, looked upstream as much as it looked downstream and occasionally looked to 'peer' organizations. The product team, on the other hand, looked upstream less frequently than expected and downstream more frequently than expected. They did not visit 'parallel' sites.

The lack of parallel visits from the product team could be explained by competitive pressures. Competition in manufactured telecommunications products has been growing since the 1980s, while telecommunications services, at least until recently, have been delivered in protected regional monopoly markets.[17] It is quite possible that some of the parallel visits undertaken in 1991 would not be possible today, just two years later. As with telecommunications products in the 1980s,

telecommunications services in Canada and many other countries are being forced into a competitive arena by technological and regulatory trends.

The extent to which telecommunications service teams look 'upstream' may be seen as a carry-over from what Pavitt would term 'supplier domination' of the telephone companies (Pavitt, 1984). The fact that their visits were actually quite balanced suggests that this domination is on the wane.[18] The product team, on the other hand, looked downstream for the most part. This downstream orientation likely reflects a combination of sense of confidence about upstream issues and an uncertainty about market and business factors.

In addition to the direction on the value chain product and service formulation team tended to look during site visit, the author also wondered where and how 'far' down the chain the teams made their visits. Using the rough five point value chain classification scheme described above, the author categorized the site visits according to their actual position on the chain and absolute distance from the visiting team. The product team's visits averaged 4.3 on the 5 point scale, with a variance of 1.4. The Service team's visits averaged 3.6 with a variance of 2.2. The product team had been placed at "3" on the scale and the service team at "4". The "distance" between the visiting team and the site they visited was also measured. The product team averaged 1.7 units of distance on a five point scale (variance .2), the service team 1.3 (variance .7).

These are, at best, preliminary results, and a more thorough investigation is required in this area. Nonetheless the results are suggestive. The product team was more consistent and on average went further down the value chain to explore new business opportunities. The

service team did not go as far up or down the value chain on average and was not as consistent in its pattern. These findings can be interpreted as tentative support for the proposition that there are differences between manufactured goods and services beyond the usual categorizations provided by marketing research (*e.g.*, intangibility, simultaneity). The differences, if established in further research, could form the basis for assisting teams in identifying which of many possible "champions" may be most useful to their inquiry.

Refinement of the model

The formulation approach described in study one was an attempt to create a model based on experience and data. Although it was not explicitly stated during the champions process, a more or less linear model of cause and effect was assumed between the application of new knowledge and application in the innovation process.[19] Experience with a "champions" team emphasized the extent to which the solution did not match that problem. More precisely the boundaries of the problem were re-considered based on experience and reflection. Two possible scenarios began to emerge. The first was that the problem was initially in "Box one" but now there was a larger ("Box one" and "Box two") problem. This raises the possibility that further "boxes" (boundary management issues) are yet to emerge and managing the formulation process will become synonymous with general management. The second scenario was that "Box one" problems were only part of the problem initially, "Box two" problems were there all along but the difficulties are only highlighted by the application of the technique.

Endnotes

[1] Most of the team members described the process as a "lead user" probe. The process was known by that name within BNR and most continued to know it as that. The term "champions of innovation" emerged only later when Bailetti and Guild were working on publishing the results of their research.

[2] In a recent interview with Paul Guild, he related how one of his former colleagues at DEF was heading off to speak to some 'champions' in another company. Many forms of direct contact with outside innovators are being used within DEF Research today.

[3] A seven point scale was used ranging from 1 (not at all confident) to 7 (extremely confident).

[4] A seven point scale was used ranging from 1 (not at all confident) to 7 (extremely confident).

[5] The technique, however, could be quite useful in exploring changes in regulation. Some of the team members mentioned this possibility explicitly in interviews. The topic of the exploration, as well as the mandate of the team, however, did not encompass regulatory issues. Although regulation is declining in importance in Canada, the rate of decline is still an important competitive issue. Future teams may be well advised to include the topic for exploration.

[6] A seven point scale was used ranging from 1 (not at all confident) to 7 (extremely confident).

[7] Part of the problem for team members is related to the frustration related to the inevitable choices that have to be made about innovations. Only a small percentage of all new products are successful and similarly only a small number of ideas reach the marketplace. One common estimate is that only 10 per cent of new products succeed.

[8] An anecdote was passed around at the time of my interviews of how the director of this group was able to obtain some time with the president of the company. He learned that the president would be in the city for a day and undertook to find out which limousine he was arriving in. Then he went to the garage and obtained measurements of the back seat and doors for the limousine. With this information in hand, he and his staff constructed a "presentation" that could fit into the back of the limousine and would pass through the limousine doors. When the presentation was picked up to travel from his meeting to the executive jet, the presentation was waiting for him in the back of the limo. The presentation was made in the 20 minutes or so that it took to drive to the airport. While the initiative this shows is remarkable, it also illustrates the lengths people felt they had to go to to get the attention of the decision makers in the company and why there was such strong support for the statements "we need a new approach to innovation" and "we need new ways of ensuring good ideas reach those who have the ability to act on them." It is also illustrative of the importance of

"making the intangible tangible" -- having something to show people when trying to put forward a new idea.

[9] Note that the "champions of innovation" process never set out to solve problems in "Box two". "Box two" issues, those that consider the boundary between team and management, were not part of the team's mandate or concern.

[10] Team members initials are disguised.

[11] This in contrast to HB's stated opinion that he didn't know who to tell or what to tell them.

[12] Is this desire to have up front commitment not also a call for protection and an assured result to the initiative? How can there be a guarantee that a recommendation will be acted upon? Perhaps this is a hope that the recommendations will at least get serious consideration and that the right people will hear about the proposal and will make the decision for the right reasons. Everyone who made an observation like this was more than willing to acknowledge that not everything was going to be a winner and not every team would come up with even one winner every time. They recognized that there would have to be trade-offs made and priorities set. They were reacting to what they perceived as a rejection of their ideas even before it was considered along with other ideas.

[13] The notion that the team is doing sampling seems in part to be related to the objective of identifying "thirty or so" champions to visit. The rule that many statistical tests require a minimum of thirty data points seems to have a spill over effect as participants make the assumption that they are participating in data collection for a statistical analysis of the "population". These assumptions appear to be held in spite of repeated discussions about "learning from extreme cases."

[14] That would seem to have been in effect for the ABC Tel team as well -- one team member felt the most important opportunity was one where he was present at the site visit, others were fixed on the opportunity they had witnessed.

[15] An informant at a large micro-computer manufacturer noted that this sort of complaint is a classic and on-going debate which engages high technology organizations from time to time. He described it as the R&D "pendulum", swinging first away from product lines and then back again. My interview with a new products manager at a large American telephone company gave an example of a company moving to integrate new product development with the product lines. A major financial institution, and partner with the telephone company, on the other hand, was moving in the other direction.

[16] A recent review of Motorola's success in telecommunications equipment includes several examples of how that company has integrated itself with its customers' value chains, in this case cellular telephone services companies.

[17] One manager of new business initiatives told us they didn't need to be 'too' innovative, since they only had to watch what was happening in other jurisdictions and be prepared to follow suit in a year or two! Needless to say, this sort of approach will not be effective when the competition sets up in your own back yard.

[18] At the 1993 SuperComm conference in Atlanta there was a large demand from service providers to get ISDN equipment providers to improve the availability and interworkability of their products. (Lindstrom, 1993)

[19] Some recent work on the problem of communicating information about uncertainties ("risk") appears to offer some insight into the process that is at work here (Leiss, 1994). As Leiss describes it, Weaver's model of the communication process is a mathematical one based on the engineering problems posed by Shannon. The model includes inputs and outputs but also "noise", the forces that cause a signal to be deflected or distorted from sender to receiver. Once the multiple boxes of the formulation process and the influences of management on the beginning and conclusion of the process are taken into account the whole thing starts to take on the appearance of a communication model. This material emerged after the field research had been completed but offers the potential for further insight as the champions of innovation process and its relation to the environment is explored.

Chapter Eight

Study Three

Study three is an exploration of the formulation process for telecommunications services and equipment in organizations which do not use the "champions of innovation" method. Four innovation teams, which emerged from a new product development process at a Canadian telephone company, were identified and interviewed. Two are internal, service oriented teams, and two are external, equipment oriented processes. The external teams were identified through their activities as suppliers to the telephone company.

Introduction

The GH Telephone Company ("GHTel") operates provides local and long distance telephone services, as well as related telephone company services for the province in which they are located . The company has under 500,000 lines in service, with more than 1,000 employees. GHTel has a completely digital switching network. The transformation of the network to a totally digital system was the company's chief objective for the past ten years.

Since 1990, however, with the achievement of that milestone in sight, as well as competition in the telephone business becoming a reality, the company has begun to shift its focus from the engineering and capital expenditure hurdles of a digital transformation to revenue replacement and enhancement through new and improved services. Two of these new services came to the author's attention in the later summer of 1993. They are identified in this case study as "Voice Mail" and "Telephone

Talk". The president of the company was contacted and as a result the researcher obtained the cooperation of senior executives to write up a case study of these innovations and the innovation process at GHTel.

The method used to identify the company and these services was the 'environmental scan' method used by "champions of innovation" teams in the first two studies.[1] The area of interest (telecommunications service innovation) was researched using paper and electronic search strategies to identify the most interesting articles in the past year. A quick search turned up several dozen articles including two or three which mentioned GHTel. A compelling feature of these articles was the fact that this was a small telephone company in the company of much larger organizations. As is common in the type of article the "champions of innovation" scanning technique turns up, individual champions within the organization were identified, in this case the president of the company.

The president was identified in a couple of the articles as the spokesperson on new technologies. A letter was composed describing the research objectives and listing several specific questions. After a telephone interview, an opportunity to discuss the dissertation research and how GHTel could participate was arranged. Two projects, for which GHTel was receiving significant recognition as having implemented a significant innovation, were identified. Access to the principal actors on those projects was arranged.

A note on method

My research at GHTel was not, strictly speaking, a full case-study. There was no opportunity to visit the site in this case, nor did the author have the time to interview more than three or four people

associated with each project. Nonetheless, it was thought to be useful given the close similarity to the previous case with ABC Tel and the opportunity it provided to probe the utility of the pre-development model used in that case.

The case study used Yin's recommendations for method. The unit of analysis was the innovation team or project, in this case two from one organization. Data were collected almost entirely from telephone interviews. The informants were contacted first by a senior manager in a voice mail message asking for their participation in a telephone interview. A letter sent to that manager introduced the author and included a letter for the team members which described the kinds of questions to be asked and a one page summary of the research. The manager circulated those two pages to all of the potential participants.

Next, telephone interviews were arranged with each of the seven members of the two teams. Prior to the team interviews, the two senior managers were interviewed as well. These interviews lasted approximately one hour each. The interviews were unstructured with probing of the issues outlined in the letter which was sent beforehand. Both of the projects resulted in interviews in which loose threads emerged which were followed up with calls both inside and outside the organization. This added six additional interviews (five for one of the projects and one for the other) for a total of fifteen interviews. Detailed notes were taken during the interviews and transcribed afterwards.

One of the methodological dilemmas posed by this research technique is the extent to which people tend to generalize or 'abstract-ify' processes around them. Criticism has been raise that this is one of the reasons that organizations don't understand why things work or don't

work in particular circumstances -- their analysis is based on formal statements of the job or job description (Seely Brown & Duguid, 1991). As Lave points out, this tendency is not restricted to management. Most informants will attempt to describe their work in terms of ideals or themes (Lave, 1988).[2]

This raises a problem when testing a model because people tend to describe their behavior in terms of models. They provide an abstract view on how things work. This, of course, is not helpful when evaluating the usefulness of a model. A model can be evaluated only when you take the actual practices that it describes and compare those -- either with a best case scenario or with the actual world, depending on which direction you are making for your model -- i.e., is it a helpful model or is it a model that is descriptive. Simply comparing one model with another is unlikely to yield interesting results. In these circumstances it was important to have multiple respondents for each case. It would have been better to have additional forms of data to analyze.

Research Questions

The respondents were asked two things: how a model of the innovation process (as described in chapters 6 and 7) fit what with what their experience, and what they did to identify innovative new services.

The model described to GHTel respondents emerged from participation with a telephone company's innovation team (Study one, chapter 6). That activity revealed that pre-development activities could be thought of in terms of those which the team was responsible for on the one hand and those that general management was responsible for on the other. These two spheres of influence were tentatively identified as "box 1" and "box

2". Subsequent research with a larger group of participants (Study two, chapter 7) resulted in a model of the early stages of the innovation process that emphasized flow as opposed to influence and responsibility.

This model identified at least three distinct activities that exemplified those stages. The first stage was focused on getting a research objective or parameters. Something for the team to hold in their minds as the carried out the next stages. This activity would generally precede the "champions of innovation" activities explored in the first round of research and hopefully culminate in the creation of an innovation team or project. The term *kick-off* was used for this stage. The second stage includes the six steps identified in the modified "champions of innovation" process.[3] This stage has been called *divergence and convergence.* The result of this second stage is generally a recommendation for investment. Following that recommendation, then, is a stage in which the decision is made. This is called the *decision* stage.

The questions for the GHTel respondents focused on the model -- "were these stages congruent with their own view of the fuzzy front end for innovation, and if not what was missing or misunderstood?" As the model was in its early stages, the author was looking for feedback on the model itself, as well as possible generalization to a larger set of situations.

Each of the participants was asked to comment on the model and to describe their activities during the innovation process. Their responses were evaluated for a closeness of fit between the proposed model and actual practice.

The respondents were also asked for descriptions of the innovation process they used in the pre-development phase for each of the two innovative projects identified by the scan. These descriptions were used for comparison with similar interviews with other telecommunications service providers in a subsequent study.

Research Results

Each respondent was asked to describes in detail the innovation process in place during the pre-development phase for their new services.

The services

The telephone company (GHTel) has recently developed two new services. One, "Voice Mail" was available on the market. At the time of the interviews the other one, "Telephone Talk" was about to be released. All of the core participants in the pre-development activities for both projects were interviewed. In addition, interviews were conducted with people outside the company who were involved in related aspects -- chiefly as technology suppliers. In the first instance, the one external interview revealed additional information about the innovation at GHTel as well as some interesting implications for innovation in the supplier company. It is presented here as a separate case. In the second instance the external interviews grew into a mini-case of their own and these, too, are presented separately.

Voice Mail

Introduction

In GHTel's operating area, all telephone subscribers have access to "voice mail"[4] as part of their basic telephone service. This is in

contrast to virtually every other telephone company in North America, where voice mail is sold as an extra-cost option, typically with a monthly fee of $5 to $20. In this section we briefly describe the Voice Mail service[5] and the process that led GHTel to take this approach.[6]

Three people were interviewed as part of the Voice Mail research: DK and VC were part of the Market Planning group at the time.[7] CA was the senior technical person on the project. The interviews were conducted by telephone. Notes were taken and the notes were typed up immediately afterwards. The interviews lasted between half an hour and an hour and a half.

Background

As a business model, the "free" Voice Mail is a simple concept with a relatively long history in telephony. Subscribers receive the capability to receive voice mail and are charged only when they leave a message.[8] As with long distance telephone calls, the voice mail function is part of the rental of the telephone line and is provided free to encourage usage. The income, again as with long distance calls, comes from the person making the call. When you wish to leave a voice mail message in the regional area you are charged a fee, currently twenty-five cents.[9]

The innovation process

GHTel is relatively small, by Canadian standards. The number of head office staff is also small, and this contributes to a sense of community among the staff. All of those interviewed cited the small size and resultant informal atmosphere as positive elements in the innovation process at GHTel. The company does not have a formal, step-by-step innovation process even within the departments responsible for new product development, although some respondents were familiar with the

processes "gating" processes developed by the national consortium of telephone companies.[10] [11]

The team looking into the project included some of the people responsible for the existing business customer voice mail systems. One person in particular, who was familiar with the way the technology operated, realized that some of the preconceived notions of voice mail were based on practice, not technical constraints,[12] so why not make the capability to receive voice mail free?

This idea was bounced around the group but didn't get seized on immediately, possibly because it was so dramatically different from what the other telephone companies were doing.

It was at this point that a crucial event took place. The company, in a search for new services which would create new revenues, held a series of "green light" sessions.

These green light sessions are a frequent occurrence at GHTel, coming as often as once or twice a month in some departments. The 'green light' concept is based around the premise that there is a green light for any idea. No criticisms are allowed.[13] An open, non-judgmental discussion environment is helpful, in that it gets ideas out into the open and starts them circulating. One respondent described it this way:

> The green light session means "no wrong answers." I have one tomorrow dealing specifically on how we market these services that are being 'given away' to customers.[14] The format is, we book a room, away from telephones and get together for a couple of hours with a mixed group of people. In this case we will include people from support, planning, and the product manager. The product manager and support person just did a tour of the province and spoke to employees all across the company, asking for their input on how to market the service. They will bring the results of those discussions to the meeting. We'll put all this on a 'flip chart', try to map out a strategy and a time line on how to communication with our customers. This is a typical green light session. [VC]

These sessions are particularly frequent when there is either a higher degree of uncertainty in a project, or a decision point is required. The Voice Mail project was identified in a green light session that included middle management and several members of the executive team. They were looking for input on new directions, given the need for new services that would replace long distance revenues. The person who was familiar with the technical aspects of voice mail and had the idea of charging for usage instead of creating and maintaining the mailbox idea raised the idea at this session and received an almost instantaneous 'go ahead' from the executive. He indicated that the idea had been rolling around in his head for a few months before he was able to get it in front of the 'right' audience. During that time he mentioned it to a few people and confirmed for himself that the project was technically feasible.

All of the people interviewed at GHTel pointed to the open and casual attitude of the senior executives as a key factor in their ability to bring forward innovative ideas and know that they would receive a fair hearing. Informants reported that they did not feel intimidated bringing their ideas in front of the executives. More importantly, it seems, there was a high level of casual communication among and between managers and executives. Some informants spoke of knowing them personally, others indicated situations in which an executive would stop by their office and talk. As a result, it seems, a level of trust built up that was extremely effective when the time came for significant changes.

The result

In this case it appears that the ability to conceptualize an innovative new service was based on an intimate familiarity with the technical aspects of the underlying technology and the business model of related services. In the case of the people responsible for the Voice Mail project, as well as the executives who approved it, the idea had a 'fit' with the fundamentals of telephony (usage pricing) as well as a positive corporate example of making things happen by "pricing them for success" (i.e., the "Centrex" experience).

Previous experience with service innovation suggested that a significant delay exists between recommending new services and actual implementation. Part of that delay must be attributed to a structure which requires an innovative idea be presented to people without the authority to implement it. In the case of Voice Mail, a decision to implement blanket zero-cost voice mail was made "on the spot". Middle managers and the project team actually had to argue that they needed extra time to put in place a trial and work out marketing strategies.[15]

Another delay for innovations occurs when the time isn't 'ripe' for a particular innovation. There is some evidence of this in the time that elapsed between the initial idea and the opportunity to raise it:

> There wasn't much preparation. I had kicked the idea around for a year and run it past a few people and got blank looks. That happens frequently -- you have to wait for the right time for an idea like this.[16] It was almost six to nine months where the idea was floating in the back of my mind, waiting for the opportunity to present itself. So, I put in a couple of days preparing a presentation and then it got accepted. [CA]

Note that the innovator didn't walk in to an executive's office when he thought of the idea, he waited for the right moment. Perhaps what is important then, is not that people will walk in and present ideas but

that they think they could walk in and present ideas. If they believe this they will be inclined to think them up and therefore when the right moment comes along, and you ask for ideas, then people will a) have something to offer, since they have been thinking about it for a while, and b) not be reticent about bringing it up. A similar situation was reported in interviews with a financial institution. They don't do much more contacting of the executives than at other firms but when they have the opportunity they take advantage of it (and are able to take advantage of it because they have something to offer).

Messaging, Not Answering

What happens when an equipment supplier is presented with a customer who wants to dramatically alter the way in which your equipment is priced to their customers? This mini-case discusses how innovation in telecommunications service has resulted in innovation for telecommunications equipment provider.

Introduction

IJ Communications (IJC) is a publicly held company based in California. In the telecommunications business IJC is widely regarded as a leading firm in voice mail applications. They were not the first in the field, but a series of early innovations and acquisitions has resulted in a dominant position in the industry. IJC has done very well in Canada. Compared with the rest of the world, IJC has a larger share of the total market and Canadians are greater users of voice mail systems on a 'percentage of installed lines' basis.

Background

IJC is the primary supplier of voice messaging equipment to GHTel and was contacted early on in the discussion of a universal voice mailbox in

that province. Although no significant technical changes were required in their product, the salesman in charge for that area recognized that the deal with GHTel had the potential for significant change in his company.

IJC grew rapidly in its first few years of existence, providing a product for which there was un-met demand. More recently sales have slowed and the company president's ambition to create a "billion dollar" company by the year 2000 look to be difficult to meet given current rates of growth. The problem for IJC has been the relatively slow growth in numbers of telephone lines in North America. Canadians and Americans are approaching saturation in terms of lines per person and the "take-up" rate of voice mail has been relatively slow in the residential market, the one remaining untapped area.

The potential for growth is seen to be in the more exciting applications relating to voice messaging, as opposed to the company's original business -- call answering. The business plans of the major telephone companies anticipate fairly slow growth in the deployment of voice mailboxes. The anticipated 'critical mass' of subscribers sufficient to support messaging services[17] will not arrive for another five to seven years.

The innovation process

In this case, the innovation process at IJC consisted almost entirely of listening to a customer and recognizing when their customer's plans meshed with the company's long term vision. The two key elements responsible for this are contact with customers and a clear understanding of the vision of the company so customer needs can be translated into opportunities for the organization.

When an IJC employee saw the Voice Mail proposal from GHTel he recognized the connection between it and the corporate 'vision' he had heard from the executives at Octel. He took GHTel's ideas back to the head office in California and started selling the idea internally. The idea to be sold, in this case, was that IJC should stop looking at their business as one of delivering to their customers "boxes" which answer telephone calls, but participate with their customers in promoting voice messaging activities:

> I believed in the vision. The president would say that he has the same visions. If you go in the middle of the company you get a whole different set of push-backs, because it runs into a whole set of other people's objectives. But as a company, that is our vision, and I think our executives recognize that. And it was articulated to some degree in the company so that when I heard GHTel's story I recognized it as being consistent with the corporate vision. [TR]

The staff member discussed the idea with a senior person in the company, a vice-president of marketing. He was new to the company (less than two years service) so didn't have a personal relationship or long history with any of the corporate officers. As he describes it, he just went to the person who would most likely be responsible for such an innovation. This was not a difficult "sell", but the hard part was convincing middle managers:

> The hardest sell was selling it internally to the people in between. Because those people have objectives they need to achieve that may not fit into this paradigm. In other words, if you have to sell X number of boxes at X amount of money, and I come up with this idea that changes the whole pricing structure -- how does that fit into their objectives? That's the problem. [TR]

The informant was able to get some of the executives to come up to the telephone company's headquarters and meet with the senior management. Similarly, CA (an internal "champion" for the project at the telephone company) had executive support at his end. Once executive 'buy in' was established, things moved fairly quickly at Octel, although

there were still three or four months of working out details regarding the relationship between the two companies, the specifics of the trial and some development 'gates' that would define the stages at which 'go/no go' decisions would be made.

The result

As with GHTel, the chief innovation was a revision of the pricing model used by the company.

> GHTel had a vision and we bought into that vision. From a field perspective we brought that back to the corporation and defined what development ought to be. "Development" initially was not so much technology but approaches to pricing structures that made sense for this new application. To be specific, what we have been very good at as a company is selling machines to service providers who then turn around and rent mailboxes or space on these systems to users for $5 to $7 to $20 a month. Our pricing structure makes sense for that sort of application. But if you look at an application like Voice Mail, where they want to give the mailbox away, all of a sudden that pricing structure doesn't make sense. The pricing has to be more oriented towards the customer's incremental slope of revenues. So if there was any significant development that was it. Technically there wasn't anything fancy that went on. [TR]

In this case as well, by turning the pricing model on its head the company dramatically changed its approach to customers and in the process changed its business direction overall.

As he pointed out to me, the business concept was given to them more or less fully formed. As in von Hippel's experience, self-interested customers provided the inspiration for innovation (von Hippel, 1985).

> The typical telephone company approach is the opposite to what GHTel has done. The approach is to sell call answer and once we have enough of those mailboxes out there we can offer people the ability to message to each other etc. The GHTel view is you will probably never obtain that critical mass. So let's create that critical mass. From my perspective, I viewed what GHTel wants to do as where IJC as a company has to go in the future. In other words we have to migrate the customer base from strictly answering telephones to starting to message. Thereby creating a whole new network for communications. Which is what we've done. So you take the GHTel experience. Now you have a totally new network that it available for non-simultaneous communications that

has a whole variety of uses that are not available on the telephone network. [TR]

Telephone Talk

What happens when a service innovation concept is given to a team with very little additional information? In this case members of a planning group were given nothing more than a phrase and used it to build an extremely innovative application that moved their company into new areas of business and new markets.

Background

In November of 1990 the vice-president of marketing at GHTel suggested to his managers that they look into the idea of 'branding'. That single word was the extent of his direction and from then until the spring of 1991 the topic came up periodically during regular meetings of the planning group. The direction was sufficiently vague that some of the planners were wondering if he was interested in a new logo for the company.

The innovation process

In June of 1991, two new members of the department were looking for something to do that would differentiate them from a larger project then occupying most of the people in the department. No one objected when KC and DD offered to look into the "branding" project. Before they could proceed, however, they realized they had to get a better idea of what "branding" really meant. So they set up a meeting with PG, the marketing VP. These three met for more than an hour and the discussion went around several topics. Finally KC felt he understood. "There are two kinds of branding, physical and electronic. The kind you are interested in is the electronic kind," KC suggested. "Right," said PG. The project was immediately much clearer.[18]

With this clarification in hand, the two men began to explore the concept of electronic branding. In the world of packaged goods, a brand name is often key to retaining market share and ability to charge premium prices. Electronic products, such as telephone calls are intrinsically difficult to "brand". Anticipating a day when people would be able to choose from alternative long distance (and eventually local) carriers, PG hoped that his people could come up with a way to indicate to people who had provided the service. If it was good service, the telephone company would like to get credit for it, if it was bad service but provided by a competitor, the telephone company wanted to avoid being blamed for something not their fault.[19]

DD was a recent graduate of the Engineering management program at MIT and had taken courses with Professor Eric von Hippel. He was well acquainted in the professor's theory that innovation comes from customers and when KC and DD saw what the assignment really was they initiated a wide ranging series of discussions with customers. They wanted to know how customers would feel about a phone that displayed a "thank you for using GHTel" message, for example. They also began to discuss the technical solutions to the problem in meetings with their main supplier.

DD and KC met with several groups of customers in meetings not unlike the "champions of innovation" and "lead user" direct contact visits described in Studies one and two (Chapters 6 and 7). A set of leading customers were identified and a brief outline of the idea was prepared in the form of a short presentation. Customers were interested in the notion of a brand on the telephone but wondered why they couldn't use the mechanism to speak to *their* customers. This seemingly small

observation restructured the project significantly. Instead of a marketing tool for the telephone company, "electronic branding" could become a way for end users to enhance their own businesses.

In addition to changing the project's focus of who would be sending and receiving the messages, the hardware store owners and other people who were initially approached with the branding idea added another dimension to the project. After they heard about the idea of changing "thank you for using GHTel" to "thank you for calling Lumberland" (for example) they wanted to know why it couldn't also be "thank you for calling Lumberland, two by fours are on special this week." In other words, in addition to changing the "who", change the "what" of the messages.

KC and DD found, through their involvement with their supplier, that the current group of residential 'display' telephones (marketed for "CallerID"[20] related features) would not be suitable for receiving arbitrary messages, but that two types of telephones Northern had in development would be suitable. One, the pay telephone, had a display that could be remotely programmed using proprietary technology.[21] The phone also had a second feature that was to prove important -- one or two rows of 'speed dial' buttons that can be used to invoke a call to a particular number. The buttons can be programmed to provide a 'free' call that is charged to the called party.

The two investigators from GHTel took these ideas to several discussions with people who get a lot of their customers from pay telephone users, including the a taxi company and the local franchise of a pizza company. The pizza company was engaged in an aggressive three-way competition for the delivered pizza business at a local army base.

Most of the pizza calls on the base originated from pay telephones, and the pizza vendors went to considerable lengths plastering the phone booths with advertisements for their current special deal for army personnel. KC and DD spoke to one of the pizza operators and asked how he would feel about having pizza advertisements scrolling across the pay telephones on the base and a speed call button linked to his call centre. He was extremely interested.

KC and DD found out that the pay telephones were about to be replaced on the base and that they were going to use these new pay telephones. All that was required was to persuade the pay telephone manager to add the 'speed dial' row of buttons as an option to the phones. This was accomplished and a member of the pay telephone group joined their team as an ad-hoc member.

The result

When the pay telephones were installed, and the pizza operator placed his scrolling 'advertisements' on them, his share of the pizza business from the base grew from one-third to more than three quarters.[22] The president of the pizza chain wanted to hear more about the potential of such a system. When he heard it could be adapted to deliver messages into the homes he was terrifically excited, claiming it would transform his business overnight.

The home delivery of messages relied on a second form of technology, one that could be deployed more cheaply than the sophisticated computers and digital network inside the new pay telephones. These requirements were addressed by the second system under development at their equipment supplier. An experimental home telephone set being developed in partnership with an American telecommunications company, this system

offered the ability to provide interaction and messaging using the ADSI[23] signaling system. One of the benefits of the ADSI system is that it will operate over any telephone line and requires a much less sophisticated telephone set to receive the messages.

The ADSI system can send messages to an ADSI-capable phone without ringing the phone. Some people were skeptical that such a system would work. They suggested people wouldn't be interested in receiving advertising information on their telephone. As it turned out, people did find it useful and it proved extremely popular in trials. The suspicion that it wouldn't work, and the way that the team was able to provide the information in such a way as to make it attractive to home customers, is example of the extent to which direct contact with people outside the telecommunications industry was instrumental in refining the GHTel Telephone Talk team's ideas.

DD and KC realized when they started talking about delivering advertising messages into homes that they were moving well beyond the current skills of the telephone company and into the world of direct marketing. In order to understand this business better, the two spent many weeks on trips to Toronto, meeting with "dozens" of people in the direct marketing business. Again, they took their presentation and sought out leading people active in direct marketing -- advertising agencies, direct mail companies, catalog companies, and record club sales organizations.

For many products, a market trial is regarded as part of the development process -- well beyond the conceptualization of the idea: that takes place before development begins. In the Telephone Talk service, trials such as the pay telephone trial were very much part of

the conceptualization. They served to clarify and focus what it was that the service really was. In the end, the project which had been designed as a defensive strategy to ensure the telephone company's brand was used where appropriate produced an aggressive move into a new market area, direct marketing.

Pay telephones with a future

When the GHTel team was evaluating technologies that could deliver their vision of "branded" telephone service, one of their first choices was a trial using pay telephones. One of the GHTel informants suggested that until the Telephone Talk trials little was known about the advanced features in these phones, including screens and automatic dialing. In keeping with the research objective of obtaining "triangulation" of information, input was sought from several people involved in the early development of the new pay telephone. What emerged was an interesting case of innovation in telecommunications products and a useful contrast between the fuzzy front end for products and services with a common focus -- the pay telephone.

Introduction

The pay telephones were long a profitable, albeit somewhat 'sleepy' aspect of the telephone business, both for the telephone companies and the producers of coin telephones. In both Canada and the U.S. regulated monopolies and their associated manufacturing divisions dominated the coin telephone business. All that changed in the beginning of the 1980s when U.S. telephone services were deregulated, including pay telephones. The changes that the American pay telephone business underwent and the innovation that grew in that market was a spur to developments in

Canada, in anticipation of similar regulatory relaxation in this country.

Background

Pay telephones have been around almost as long as the telephone itself, dating back to the turn of the century. The once-familiar 'three-slot' design, with holes at the top for quarters, dimes and nickels was introduced in the early post-war years and was only superseded by a modified ("single slot") version in the 1970s. That revision, however, was only a minor change without any substantial revision to the underlying network architecture or business model. The next change was to have much more profound implications for the pay telephone business.

Several people commented that the pay telephone business was long considered a bit of a backwater within telephone operating companies. It was a place for people to retire or transfer to if they didn't fit into the challenges of other parts of the company. When coin telephone services were deregulated in the U.S. in the early 1980s, and the OPC System was broken up into regional OPC operating companies (RBOCs), a few clever entrepreneurs seized on the opportunity to set up their own private coin telephone businesses in lucrative locations such as hotel lobbies and airports. At first they competed with the local telephone company on price, offering the airport authority or hotel owner a larger fee or share of the profits from the coin phone.[24] Later, these entrepreneurs began to compete on the basis of additional features and services -- offering telephones that accepted credit cards, for example.

The innovation process

In the case of these phones, the innovation process centres on three key players. The manufacturer of the phones is KL Tele-communications (KLT) . Three people, TJ, BJ, MD, were interviewed at KLT. The research and development for the telephones was done by MN Research (MNR). The researcher spoke to FL and CA of MNR. The project was initiated by OP Canada (OPC), a telephone operating company Canada.

In numerous instances, and rather too often in the eyes of observers, innovation in the telecommunications field has been driven by technology as opposed to need. A bias toward 'technology push' instead of 'demand pull' is cited as a major reason for the slow acceptance of some recent telephone innovations such as the Integrated Services Digital Network, or "ISDN". The pay telephone case is particularly interesting in this regard, because it represents an example of demand pull. According to one respondent, the initiative to sponsor a search for new pay telephone technologies that eventually led to the development of the telephones can be traced to a OPC executive who encountered, in an American airport, a pay telephone which accepted credit cards. When he returned back to Canada, he demanded to know what OPC was doing to provide such service.

The group who received this demand was, for a variety of reasons, somewhat unique in the pay telephone business. According to several industry observers, innovation and initiative were not the hallmarks of the average pay telephone division in a large telephone company. The heads of the pay telephone division at OPC, however, were actively involved in their businesses and took an entrepreneurial approach. They also had the benefit of two information sources that helped them make

decisions in the context of rapid change. The first was a business management tool developed by Bellcore, the research arm of the former Bell operating companies in the U.S. The management tool consisted of software—called "COIN"—that allowed a 'profit and loss' analysis of pay telephone operations down to the level of individual telephones. Using this tool, the middle management of the pay telephone division competed amongst themselves to enhance the bottom line for their area.

The second source of information was the lessons the pay telephone managers were able to learn from their colleagues in the U.S., who were going through a deregulation process that many felt heralded changes to come to the Canadian marketplace. The pay telephone business is very "close", according to two respondents who have worked in it for several decades, and OPC managers got even closer to their U.S. counterparts by visiting several of them in person and in teams. Through this direct contact they learned how they should prepare for competition and importantly, what not to do when it arrived.

In the context of the new pay telephones, one of the first responses to the request for action by the OPC executives was the purchase of a couple of credit card pay telephone systems (about 100 phones) for use in their region. This served two purposes. The first thing it did was provide some "breathing room" by showing the executives that things were happening. More importantly, however, it introduced a senior technical person within the pay telephone group to the possibilities of enhanced network support for pay telephones. This person, along with a marketing manager, went on to specify some of the requirements for a new kind of pay telephone to be developed for OPC.

OPC has long regarded KLTas its primary technology supplier for telecommunications equipment. They are both owned by the same holding company and the relations between the two companies are extensive and long standing. In the case of the pay telephones, the people within the pay telephone division of OPC imagined that if KLT developed a new phone system for them, KLT could sell it around the world. The idea of a new pay telephone system came at a propitious time, since until deregulation KLT had been virtually locked out of the American pay telephone market by Western Electric's close ties with AT&T in the U.S. After the divestiture, the regional OPC operating companies were required to get out of the equipment manufacturing business and were therefore more open to potential purchases from KLT.

KLT responded to OPC Canada's request for a new pay telephone system with a product description. This description was reviewed by the senior technical person at OPC Canada and largely rejected. In his view, the KLT proposal did not go far enough in terms of a network architecture for the future. While the KLT vision was consistent with their direction -- the intelligent pay telephones were to be implemented as additional services on a digital central office switch -- it would have placed the pay telephone operators in a difficult position within the organization. Additional features, changes and enhancements would be pooled with other digital central office switch line features that other divisions of the telephone company wanted. As such they might have become ranked lower and possibly moved off the priority list altogether in a cost-cutting environment. Programming changes to digital central office switches are also notoriously lengthy to complete (by some reports there are 20 million lines of code for a digital central office telephone switch),

making the pay telephone business, which was used to a relatively autonomous operation, less agile than they would like. Through a series of discussions an entirely new network architecture was developed, one that addressed the concerns of the pay telephone operations and gave them increased power and flexibility in the resulting system.

While the network architecture details were being worked out, research was also being conducted at MNR, the R&D arm of KLT and OPC. Here the user interface and market acceptance issues were worked out with considerable effort, including user interface design specialists, focus groups and field trials. The new pay telephones take advantage of their new network architecture through a variety of new user features, include credit card readers, volume control buttons, a fluorescent display, 'speed call' buttons, and a language choice button. Each of these was developed, refined and tested in the MNR laboratories and field tested at sites around North America.

The lead person on the new pay telephone project for MNR was FL. She, along with a few others at MNR, cooperated with both OPC (RN) and KLT (TJ) to work out the final design. Internally, at MNR, the new pay telephone group functioned very effectively as a team, according to FL. One of the key reasons for that team spirit, she felt, was the personalities involved. Another was the frequent and casual communication that she was able to have with the clients -- OPC and KLT -- about their needs and desires. It was clear to the MNR team that TJ's project was something he believed in strongly and it was something he was doing for the good of the company, not for the good of his career. Having a 'neutral' objective like this made it possible for the team to focus on a common goal, she felt.

The 'fuzzy front end' for the new pay telephones lasted almost four years. The first comments by OPC executives were in 1982 and serious development did not take place until 1986. While the product is considered a success today, and the development process is regarded as an example worth emulating,[25] the length of time at the front end was not the aspect of the project that people found interesting. The delays the project experienced were not insurmountable, but they were in some ways typical of the kinds of problems one can expect when introducing significant change to a large organization.

One of the most significant sources of delay was caused by what might be called "corporate inertia." In the case of the new pay telephones, proponents had to convince the rest of the company that developing a new pay telephone was better than doing nothing. In the case of pay telephones there was a considerable history that pay telephones were product line with few technical innovations. Moreover, because of the extent to which operating companies were tied to equipment manufacturers, there had been few chances in the past to expand markets or compete in pay telephones. KTL gained most of its revenue and prestige from digital switches -- large, multi-million dollar computers that converted phone calls into digital pulses and routed them to their destinations. Compared to that, pay telephones were not an interesting project. This is despite the interest of OPC.

According to interviews with participants from MNR, OPC and KTL, the new pay telephone project suffered an almost two year delay between the opportunity scoping decision (informally between KLT and OPC, with input from MNR people), and the subsequent operational definition of the

product opportunity which was done in 1983-84 until the development decision at KTL which took place in 1986.

The result

From the perspective of the telephone operating company the new pay telephone system represents a significant architectural change in the way they run their business. From the end-user point of view, however, it retains many familiar features and is, if anything, easier to use that the models which preceded it. The system contains numerous platform features which will allow KLT and the telephone companies to roll out enhanced public telephone features over the next few years while refining and improving the way that the phones operate in the field. This is clearly a case of a telecommunications product that has its origins in a "demand-pull" model. Yet it also took a considerable length of the time to get through the pre-development stages. In terms of the proposed model of the pre-development innovation process, this case suggests that an organization needs to pay as much attention to the stages which are not defined as they do to those which are.

Endnotes

[1] See chapter 5 for a description of the "champions" method and chapter 6 for a description of its recent use in telephone carriage.

[2] John Seely-Brown reports: "Lave (1988) argues that informants, like most people in our society, tend to privilege abstract knowledge . Thus they define their actions in its terms" (Seely Brown & Duguid, 1991:42, note 2)

[3] The initial instances of "champions of innovation" as described in the literature included only four stages (Bailetti & Guild, 1991b). The initial (stage "0", selecting the topic and team) and final (stage 5, presentation to senior management) stages were added later by one of the creators of the technique and were used in the instance described in study one, chapter 6.

[4] Alan Freedman's *Electronic Computer Glossary* defines voice mail as "Computerized telephone answering system that digitizes incoming voice messages and stores them on disk. It usually provides auto attendant capability, which uses prerecorded messages to route the caller to the appropriate person, department or mail box." The predominant feature of voice mail systems is telephone answering: "A feature...in which incoming callers are immediately directed to the called party's voice mailbox where they hear a personalized greeting in the called party's voice and are prompted to leave a detailed message." (Harry Newton, *Newton's Telecom Dictionary*).

[5] Additional details about the service are inserted as notes to the text.

[6] It appears, however, that there is considerable interest in what GHTel has done. They have been visited, they say, by most of the other telephone companies in North America and some of them are considering the GHTel approach. Alberta Government Telephones Limited (AGTL) is one company that is currently running a trial of this type of service.

[7] Names and initials have been disguised.

[8] Voice mail is a term to describe telephone answering systems that are based on mechanical, rather than human, systems and available to groups of two or more people. It is typically differentiated from a telephone answering machine by the ability to route messages between different users of system. Numerous other features have emerged in recent years, including connections between voice mail and facsimile and electronic mail messages.

[999] Initially the pricing was time-based, as long distance calls are, but it quickly became apparent that this was confusing to customers and more trouble than it was worth, so a flat rate was introduced instead.

Almost all other telephone companies have positioned home voice-mail as a call answering service, to compete with home answering machines.

Typical 'penetration rates' in the business are under ten per cent of subscribers with growth in the five per cent per year range up to an estimated maximum of twenty to twenty-five per cent of subscribers, according to a Voice Mail developer.

Telephone companies, along with many other telecommunications service and equipment suppliers, got into the voice mail business through their private branch exchange (PBX) business. Voice mail systems were created initially as adjuncts to the office PBX, allowing subscribers to record a greeting for their callers and allowing callers to leave a message. Additional features in a PBX environment included internal voice mail - sometimes called voice messaging, an interactive customized menu for incoming callers, broadcast messages, bulletin boards, and mail groups.

GHTel, along with most of the other telephone companies in Canada, examined the possibility of offering a residential voice mail product to complement existing commercial services already offered by the telephone company. The path being taken by Canadian and American telephone was an emphasis on answering the phone. In fact the service is marketed as "Call Answer" in many parts of Canada. When GHTel began to explore the call answering market they discovered that ordinary telephone answering devices, the equipment "Call Answer" is designed to replace, had a very low penetration rate in the region. Less than 10 per cent of homes had an answering machine, in contrast to other provinces where close to fifty per cent of homes have such a device. The prospects for significant income from such a service did not look promising.

GHTel, like other telephone companies in Canada at the time, was concerned about CRTC hearings into competition in long distance services. It seemed inevitable that some form of competition would result and revenues from long distance services would fall. With a corporate commitment not to raise local access rates to supplant those revenues, there was considerable pressure to identify new services that could broaden the corporation's revenue sources. The team working on call answering reported that they looked at the potential revenue from "Call Answer" and decided they were willing to consider new ideas.

[10] "Stage-gate" innovation processes are a fixture of new product development for manufactured goods. Some of the academic sources of this approach include the Canadian business innovation process 'guru', Robert Cooper (Cooper, 1990; Cooper & Kleinschmidt, 1987; Cooper & Kleinschmidt, 1991). Northern Telecom and Stentor both use a 'gated' innovation process in which projects move through a series of pre-defined decision points, or 'gates' before appearing in the market. Although there is considerable evidence of the worth of these processes in the world of manufactured goods(Maidique & Zirger, 1984) , service innovation has been slow to recognize the benefits.(Grönroos, 1990; Gummesson, 1989; Langeard, et al., 1986; Rathmell, 1974)

[11] For Voice Mail, a small group within market planning was looked into the feasibility of creating a 'call answer' type of service in New Brunswick. As mentioned earlier, a preliminary market analysis based on secondary sources, suggested a poor market in the province for such a service with relatively low penetration rates. According to VC, one of the attractions of providing voice mail types of services to the home is that they are a platform for numerous other services which emphasize a

messaging, as opposed to an answering, communication model. In other words, once enough people have a voice mail box, then it becomes extremely attractive to the telephone company (and other service providers) to do additional things with the capability. Companies do this to some extent already, with the use of distribution lists for work or interest groups and 'broadcast' messages to alert users to changes or other important developments.

In the public voice mail market, software and information developers see an opportunity to develop custom 'voice mail' information packages that are economical to deliver once voice mail achieves a certain penetration rate. As an example, weather information could be deposited in a voice mailbox each morning, or stock prices, or soap opera updates. The existence of those services could make the installation of a voice mail system, which has an extremely high capital cost, much more attractive to a service provider like a telephone company. Unfortunately, until market penetration reaches 25% or so, most telephone companies have regarded these additional features as unlikely to succeed.

[12] The pricing model, in particular, was based on the capital cost of a voice mail system. These systems are basically a computer and a great deal of digital storage capacity in the form of multiple hard disks. The vendors sell them in terms of the number of users they can accommodate, based on some average use estimates. The number of users and the cost of the equipment is used to determine a "cost per user" which is then used to calculate a monthly fee (typically $5 to $10 per month in Canada). The team realized that this pricing model resulted in charges being allocated to the creation of mailboxes. Because voice mailboxes are really nothing more than computer 'addresses' this charging scheme was based on convenience rather than real costs. It costs essentially nothing to create a mailbox - the expense is in the usage. So the question then became, why not just charge for usage? This is the way telephone companies charge for their major source of revenue—long distance calls—after all.

In addition to the 'long distance' model, the people at GHTel had another precedent to look to when considering how to define voice mail. In the early 1980s the advent of digital switching opened up the possibility of providing 'PBX-style' telephone services to people directly to their desks without purchasing a PBX system. (These include intercom, call forwarding, call transfer, toll restriction, least cost routing, and call hold. The services are based on capabilities in digital telephone switches.)

These were generally marketed under the name "Centrex". The large telephone companies in Canada had large PBX businesses and assumed that only a minority of subscribers would opt for a Centrex type of service. As a result, the telephone companies tended not to price Centrex so it would compete aggressively with their existing PBX sales business. GHTel, with relatively few PBX sales and a modern digital central switching network made the assumption that Centrex would be very popular and priced it on that basis. As a result, the majority of their business customers use Centrex, while other telephone companies in Canada (i.e., Bell Canada) have only a minority using it. In the words of one informant:

> We were looking into Centrex, and first looking at DMS technology and at the same time we were looking at the possibility of selling PBXs and all that as well. We, however, are what we call a rural telephone company and we can't really afford to have all this equipment on customer premises. Someone came up with the idea of providing all the services from the switch. What we did was assume success - we assumed all of our customers would use Centrex and so we priced it accordingly. The folks at a place like Bell Canada assumed that 10 or 20 per cent of the customers would use Centrex, but when we build our rates we assumed that everyone was going to use it. What happened was that our rates went down to half of what Bell Canada's are, because we have the volume. And we have 80 per cent of our customers using Centrex, and [other telephone companies] have maybe 20 per cent. In other words you get what you strive for. But their paradigm was minimizing risk, which isn't wrong, where ours was maximizing opportunity. Both worked out appropriately. It just happens that in a recession ours works out particularly well because in a recession it is nice to have a rental service where the income remains steady as opposed to a hardware sales business where the revenues go up and down. (CA)

This steady income was an enviable attribute during the recent recession. More importantly, however, it appeared to give the people at GHTel confidence that they could succeed even when taking a path different from the other telephone companies and that the underlying price structure of a service is often the most important thing over the long run. As a result of GHTel's decision to promote Centrex as their solution for small and medium sized business telephony, they are not only well positioned financially but also well placed in terms of deploying new services. With a rental business they are not faced with the daunting task of persuading people to update equipment before a new service can be made available. They just either reprogram or replace whatever pieces in their system that require changing.

The service concept then became quite similar to the core of the telephone company's business - long distance calling. Everyone who has a telephone can receive a long distance call. It doesn't cost anything to have that capability. But when you make a long distance call you are charged for that.

[13] This kind of approach has a long history in the 'brainstorming' literature (see references in Chapter 3).

[14] In other words, pricing is based on usage rather than a monthly fee and therefore revenue depends on frequent reminders to use the service. Long distance calling required this kind of marketing (until fairly recently).

[15] Some authors argue that reduction of the elapsed time of a particular 'stage' in the innovation process should not be accomplished to the detriment of the <u>overall</u> length of time. In this instance, although approval was swiftly obtained, the innovating team chose to delay implementation for a while and consider some of the further implications of this decision.- The marketing challenges are an example.

It could be argued that considering these aspects of the development process at a very early stage, when few resources are committed, is less expensive than devoting the attention of a full team later on.

[16] There are equivalents here in the case of product innovations as well. A 'next generation' attachment for a line of telecommunications equipment wasn't interesting to the product managers of that line until a year after an innovation team recommended it. Then they wanted it immediately, not because the idea had changed but because their circumstances had changed.

[17] Like fax machines, or the telephone itself, voice messaging is more useful the more people are using the system. Early research on the utility of a voice telephone network indicate that as subscribers increase, the usefulness of the network increases on a logarithmic scale. Slowly at first but then proving dramatically useful when a certain threshold is passed. We can all recall when the question changed from 'do you have a fax machine' to 'what is your fax number?'

[18] According to both KC and DD, this sort of vague instruction is characteristic of their relationship with their supervisor. Both men admire him greatly and feel he is both a visionary and largely responsible for the innovative atmosphere in their department. They attribute the vagueness in part to a desire to let people explore on their own and in part to the fact that he is 'out in front' of many trends and as a result the ideas are difficult for people who are focused on current realities.

[19] Many alternative long distance providers use circuits leased from the telephone company or others in bulk. They re-sell access to those circuits to make a profit. There is a temptation to compress and multiplex (mix multiple calls on one circuit) calls and thereby increase revenue or solve temporary surges in demand. Compression and multiplexing, however, degrade the audio quality of the call.

[20] "CallerID" is based on a telephone protocol known as signaling system seven. This provides the called party information on the calling party in the form of 'out of band' signaling - it is not delivered along with the call. One of the advantages of this is that it can arrive before the call is answered - so you see who is calling - and can be recorded by the telephone even if the call is not answered - so you can see who called you.

[21] The new pay telephone case is dealt with at length in a separate section at the end of this chapter.

[22] Whether it was the free calls, the fact that there were messages on the phones, the discounts offered to callers using the system, or the messages directed to specific groups of visitors to the base, was not determined.

[23] "ADSI" stands for Analog Digital Services Interface and provides a mechanism for 'tone' phones to exchange digital information, suitable for computer to computer interaction. One typical application is home banking, where the telephone is given a display screen and can be

programmed to simulate the buttons on an automated telling machine (ATM).

[24] Ironically, they were able to do so on the basis of their use of 'surplus' coin phones purchased at a large discount from local telephone companies. The greater their success in displacing pay telephones, the greater the numbers of surplus coin phones available for purchase on the used markets.

[25] According to FL, there was some discussion about the possibility of writing up the MNR experience as an internal case study. The outcome of those discussions is not known.

Chapter Nine

Study Four

This case describes innovation processes in a leading application areas for telecommunications: the finance/banking sector. The financial sector is a large vertical market for telecommunications. Banking is undergoing significant change as a result of de-regulation and competitive pressures.

Introduction

The champions of innovation methodology itself, as well as the focus on a value chain analysis in the first two cases indicated the importance of obtaining information from key customers during the innovation process. One of the key vertical markets for telecommunications services are banks, insurance companies and financial services (e.g., brokerage houses, commodity traders). Following a round of exploratory research, in which several banks were contacted and a series of interviews led to a better understanding of the innovation process for services in the financial sector, the decision was made to focus on one financial services firm in particular. A Canadian financial organization with an industry-wide reputation for innovation was identified and key personnel were interviewed.

This does not constitute a full case study, as the number of informants is limited to three and only limited field observations were possible, but several key findings from larger cases were also observed here. The geographic proximity of "OP Finance" (a disguised name for the financial institution) makes it a prime candidate for more in-depth

follow-up research at a later date. Preliminary observations are presented below.

The interviews and observations revealed an organization developing innovation processes and techniques suited to its unique characteristics and drawing on the strengths of a small, informal, and committed group of managers. The result is a culture of innovation in an industry not known for change.

Who is OP Finance?

OP Finance is a retailing banking company with over $3 billion in assets and approximately 1000 employees. OP Finance has experienced rapid growth in its branch banking in recent years and continues to open new branches to deal with the rapid growth in population in the regional area.

"Retail" banking, or individual customer banking, is OP Finance's area of expertise and they regard it as their core business. Many of the larger banks in Canada had neglected this side of their business in the 1980s instead focusing on larger customers and wholesale (credit cards) business. The banking business has recently become much more competitive and changes in "back room" bank technologies have made it possible for the large banks to re-enter this area in a competitive way. The key to success in retail banking is customer service.

OP Finance is known as an innovator in the provision of customer service in Canada. OP Finance was one of the first financial institutions to offer telephone banking to their customers. (Telephone banking started in 1987 at OP Finance, compared to 1993 for some of the chartered banks.) OP Finance continues to innovate in both hard (optical storage and retrieval of bank documents) and soft (in 1993 two branches

implemented a system of 'greeters' along the lines of those used by Walmart) technologies. This record of achievement as well as recent mention in financial trade press as innovators, suggested that OP Finance could provide some useful insights into successful service innovation.

What were the research questions?

OP Finance has a reputation for innovation among industry observers, the public, and competitors. Much of their success relates to a telephone banking system that continues to be expanded and enhanced -- a telecommunications service innovation. For this case study the questions were: how do they innovate? What processes, if any, do they use? Do they use teams? Are they concerned with the speed of their decisions?

How did the research proceed?

The vice-president of research for OP Finance was identified from an article in a financial industries trade magazine. He was contacted and a site visit and interview were arranged. Through him additional interviews were arranged with the Vice-President of Marketing and a branch manager. A branch location was visited and observational data was collected. Documentary materials relating to a recent innovation were also collected along with financial statements, a recent annual report and a company fact sheet.

Results

OP Finance has created an 'atmosphere of innovation' which is a key component of their ability to identify, develop and deploy new services quickly and effectively. In practice the atmosphere of innovation means that employees at all levels can regard change and creativity as a

legitimate aspect of their job and not something to be carried out only by a head office or new product development group. In order to foster such an atmosphere, several unique practices have evolved at OP Finance over the years. Two initiatives in the last five years, the "Telephone Service" project and OP Finance's annual retreat for branch managers, are illustrative of these practices.

Telephone Service

Telephone Service is a major component of the public face of OP Finance. Most of the display advertising prominently features the telephone number and many additional services, such as telephone RSP loans, have been built on top of the Telephone Service 'platform.' It is an important example of both the outcome and practice of innovation at OP Finance. The author discussed the origins of Telephone Service with the Vice-President, Marketing and Planning for OP Finance [SG].

According to SG, Telephone Service was originally conceived by a branch manager who saw the technology in action at a banking trade fair in 1985. This manager promoted the idea among her peers, focusing on the benefit that it routed calls away from busy branch staff. As a branch manager, she was well aware of problems branches faced trying to deal with walk-in at the same time as call-in customers.

The Telephone Service system provides a central number for all customer calls to OP Finance. A group of telephone service representatives deal with all routine banking matters, including such things as requests for account balances, and inter-account transfers, only forwarding calls to a branch if they must be dealt with by the branch. This model of service could have been seen as an attempt by the headquarters staff to grab power from branches, but the fact that the

idea was being promoted by a branch manager helped alleviate some of those concerns.

Branch managers realized that better customer service would help them to increase market share in all markets served by OP Finance. The Telephone Service system delivered better service in two ways. First, customers had only one number to remember and received better service from the larger pool of specialized telephone service representatives when they called. Second, walk-in customers received better service because branch staff were not distracted by having to answer phone calls.

The new service was launched in 1987 and is regarded as an enormous success by the organization. The development decision was difficult however, as revenues were down at the time. The capital cost of the telephone system was a significant expense for OP Finance. There was support for the idea at the CEO level in the organization but with low earnings the business case could not be made solely on the basis of customer service (and potential increased market share because of better customer service). In the end the decision was made on the basis of the potential savings from transferring calls away from the branches.

The branch manager who "championed" the idea was able to make use of call records from the branches to support the case for staff savings. More important, as it turned out, was the of access she had to the (then) Vice-President of Marketing and Planning. Through her contact with him she was able to determine that cost savings rather than customer service was the appropriate internal selling point for the new service. One informant attributed this level of interaction to the informality present in the organization and a lower than usual (for the

banking world) feeling of 'them and us' between headquarters and the branches. This, he claimed, allows headquarters staff to have an unparalleled level of communication with branch staff. He felt this provided OP Finance with a competitive advantage.

The author's visit to headquarters confirmed the informality. The offices of the vice-presidents opened directly onto the hall where they share shared a common receptionist. No security or other barriers were in place to discourage visitors. When the author asked for contacts among the branch managers the vice-president was able to list by name six people involved on an innovative project along with their telephone numbers from memory. During the interview with a branch manager, it was also clear that there was little if any animosity between the branch manager and the headquarters staff. He spoke of the vice presidents on a first name basis and obviously knew them personally.

One of the Vice-Presidents compared his experience with OP Finance to earlier work with one of Canada's six chartered banks:

> At the (other bank), there was a perception at the branch or regional level that all innovation was done by head office. To the extent that ideas were implemented at all they were extremely small (at the local branch level).

The author was given a copy of the organization chart for OP Finance which confirmed the essentially 'flat' organizational structure described by both the vice presidents and branch managers. Between a teller (the entry level position) and the CEO there are only 4 levels of management. (Teller, Accounts Manager, Branch Manager, VP Branch Operations, CEO).[2] More significantly, the attitude of hierarchy was not present. Informants did not make reference to hierarchy during their interviews, nor did they discuss who "reports to" who -- frequent topics of conversation among the companies discussed in cases one and two.

Much of the discussion in the first two cases involved large organizations with significant barriers between executive and 'line' management. Some of these were in the form of multiple layers of reporting, other barriers existed in the decor and detachment of the executive offices, secluded on a different floor and appointed in different colors. It was in these circumstances that the issue of "Box 2" problems was first identified. The combination of a "flat" organizational structure and informal atmosphere at OP Finance suggested fewer boundary management issues would be part of the innovation process.

Lack of hierarchy is frequently cited as beneficial to organizational communication, provided it is supplemented with efficient tools for horizontal communication. OP Finance has implemented a company-wide system of voice mail and electronic mail. This is a supplement to more informal techniques such as meetings and retreats. One of these communication vehicles, the retreat, has emerged in the last two years as a key source for innovative ideas in the organization.

Innovation in Retreat

Each year all of the branch managers from OP Finance meet for a weekend retreat at a resort town near Vancouver. The first retreat was organized by the Vice President, Sales as a way to build team spirit among the branch managers.[3] OP Finance always thought of itself as a small organization and its managers as a cohesive group. Rapid growth in the 1980s created the need to develop a more explicit program for maintaining that cohesiveness and a retreat was established to welcome new managers and solidify the team focus as new markets came on stream.

The first year, individual branch managers made presentations on unique aspects of their branch (e.g. an insurance counter, a new branch building, new technology). The focus was primarily on information sharing. At the end of the first retreat managers reported a sense of positive results but were concerned that the retreat did not lead to an action agenda. The managers knew they had left a lot of unexploited potential on the table and needed to find a better way to make use of it.

The next year the organizers asked people to make their presentations around a theme, in this case "If I owned OP Finance." The branch managers were challenged to bring with them their best new initiative, nothing was to be regarded as sacred, everything was on the table. At that meeting someone suggested an 80 per cent mortgage (by law, banks are precluded from lending more than 75 per cent of an asset value. Other financial institutions are not similarly bound but followed the standard practice) as a way of differentiating and adding value. This was essentially adopted 'on the spot' (after some discussion) when the chief executive officer decided it was a great idea. As a result, the participants ended up the weekend thinking of the retreat as an opportunity to explore ideas and contribute in a creative process. In comparison, one of the informants noted that in another bank he had worked in, local staff had very little input to the innovation process:

> …ideas from branch or regional personnel took so long to work through the pipeline that they didn't seem to connect. The time between creation and implementation was 'centuries'. As a result there was low motivation to be creative. A suggestion box program existed but no one thought it was listened to. [WL]

The following year saw further refinement and focus on the innovative ideas aspect of the retreat. As it became apparent that branch managers

were putting together more elaborate presentations and had involved their staff to help them develop ideas and create the presentation, people from head office started to become interested in attending. The rest of the head office staff (the organizers were a sub-group of headquarters, a group called branch operations) noticed the activity when people from the branches started calling the head office to request information to be used in their presentations. They also couldn't miss the obvious enthusiasm of the participants.

From the first the CEO had been present for the retreat. Some managers found this somewhat daunting at first but gradually began to feel more comfortable expressing their opinion in his presence. One branch manager stated that he was initially hesitant to speak out in front of the chief executive but over the past three years has realized that he is free to express opinions and put forward ideas. More importantly, after participating in weekend-long events where the dress is casual and no hierarchy is maintained during meals or any other events, he regards the senior staff of the company as colleagues and friends.

With the growing popularity of the event, the question became how to involve more head office managers without overwhelming the branch managers. The solution that emerged was to have both branch and head office people present for the arrival evening and first day and then the head office staff returned to Vancouver, leaving the branch managers an extra day on their own. Presentations are made to a full set of the senior managers.[4] The presentations are competitive and winners receive a small prize, awarded at the end of the retreat.

In the last two years the presentation format has shifted slightly in response to what the branch managers themselves perceived to be a 'too broad' range of ideas coming forward. Not only were the topics too wide, not all of them were consistent with the organization's strengths or direction. The branch managers and the VP Sales decided to slightly reorganize the process around teams of managers who would focus on specific strategic opportunity areas. The company's strategic plan (a five year plan, revised every three years by the VP Marketing and Planning) gave the teams the targets for their projects.

The strategic plan was a source of pride to the chief architect of that plan, the Vice President of Marketing and Planning. More importantly, it was a working document that informed day to day activities not only in headquarters but also in the branches. During an interview at OP Finance headquarters the current five year plan was out on the desk and had the appearance of a well used and utilitarian document consisting of well-organized loose-leaf pages in an orange binder. A copy of the same binder was present during an interview with one of the branch managers. That branch manager spoke of using the strategic plan during the organization and planning meetings for his innovation team.

The team approach also allowed some of the shyer managers, who found the individual presentations stressful, to continue to contribute by allowing them to share the spotlight with some of their peers. In an interview, one of the branch managers who participated in the winning presentation in 1993 stated:

> Under the previous 'cost of admission' system of idea presentation, there was a fair bit of pressure and some discomfort at being in front of all our peers and senior management. There was some pressure to restrain what you

> were saying and not say as much as you might otherwise say.[5] When we were in a team there was a sense of safety in numbers. [DJ]

A third benefit of going with teams was that there were much fewer presentations and those were of higher quality with the result that there was greater 'buy in' from the group as a whole. Without some pre-assignment and without the team approach there was too great a possibility that presentations would duplicate each other, resulting in wasted effort. The process has evolved from a single theme (examples include job sharing, fee income, branching strategies, staffing levels) to the current practice of having several themes -- one for each team (improving performance reviews, cost of expense, judging staffing levels, yield on loans).

The first teams were formed according to OP Finance's two 'districts' (the company is now organized around four 'regions'). Normally four to six people are assigned per team. The selection process is largely informal, based on interest and expertise. Currently, senior management (VPs of Sales, Marketing, and Operations, along with the Regional Branch Managers) identify general topic areas and assign teams of branch managers to that topic. The teams meet before the retreat and plan their presentation and organize their ideas. These teams then present their ideas at the retreat. Total elapsed time is under one month, with a development decision usually made within weeks of the retreat.[6]

How did the teams get their ideas and what steps did they use to develop their presentations? An interview with a branch manager provided this chronology and description.

The suggested retreat topics and team assignments came from the Regional Branch Managers (RBMs) during a meeting of all the branch

managers in mid-May, three weeks before the retreat. Earlier in the month, the RBMs had worked out topics consistent with the strategic plan in meetings with head office managers. Six branch managers were on the team which included DJ. The team had a short meeting with the RBMs to flesh out the topic and get some additional background information. Just prior to this process, all of the managers at OP Finance had been studying the activities of a comparable financial institution in the U.S. as part of a "best practices" exercise. This information was useful for the topic they had been assigned, which was to identify a way to deliver a more comprehensive "full service" financial package to members.

The team met on their own after work the following week and broke the problem down into component parts. They identified six areas and shared them among the six team members (from an original list of a dozen which were ranked in order to identify priorities). The categories represented sections in the subsequent report and included INTRO, WHY SHOULD WE, MEMBERS AND STAFF, OPERATIONS, PROS & CONS and OBJECTIONS & ANSWERS. The categories, according to one manager, were 'generic' in that they would have to be addressed for any new service. Each team member took a section and brought it back to their branch to work on.

In preparing his contribution, DJ turned to his managers for input. In the original retreats, when branch managers made individual contributions, staff involvement was key for many of the managers, according to WL and SG. This declined somewhat with the move to teams of branch managers. DJ confirmed that he had involved his staff more substantially in the original presentations. In both cases, though, the activity within the branch was relatively informal. DJ did not ask his

staff or managers to participate in a team or contribute beyond suggestions and ideas.

The team members took a week to complete their individual contributions and met again the following week to put their sections together. DJ reported that they were "amazed to find how smoothly each section fit with the next".

One of the important considerations the team took into account when they created their service ideas was a new customer service computer system, which OP Finance was in the process of implementing. DJ's branch was a pilot site for the system and he used his awareness of the potential of this as a service platform to identify how it could be used to advantage in this new service.

The team held a final meeting before the retreat where they discussed presentation strategies. Although they created a formal document, they decided to make their presentation more accessible by acting out the service in a form of a skit.

After the retreat, DJ and one other branch managers from the winning team offered to implement the new idea on a trial basis starting immediately. Their proposal was accepted by head office staff once some tracking functions were built into the trial.

Idea exchange

Since the first retreat participants have been asked to bring a new idea as a 'price of admission'. These ideas are typed anonymously on slips of paper and posted around the meeting room identified only with playing cards (only the owner of the idea knows which idea is hers). On the second day the whole group votes on the three best ideas. The creators of the top ideas get a further five to fifteen minutes to

expand on their topic. This 'idea exchange' became a second layer of innovation and rich source for new ideas. It also has emerged as something more, a kind of test market for ideas from both the headquarters and branch staff.

Services built around the 1992 retreat's top idea ("business banking") were rolled out in 1993. Given the annual budgeting cycle and the development time, this represents a very short (one or two months only) concept formulation phase. These business banking services are one of the bank's major initiatives at present. The treatment of this idea demonstrates the extent to which the retreat has become a very important venue for innovation for OP Finance and illustrates a specialized use of that process for internal test marketing of ideas.

According to the Vice-President of Sales, the idea of business banking was a good one but he is convinced that the quality of the idea would not have been sufficient for it to emerge as a development project if it was presented in a different way. He feels that the crucial element was the context of the presentation, seeing the idea and the support it had from the group, that led to the development and deployment of this service. As it happened the idea did not originate with a branch managers but rather from head office staff. By presenting it at the retreat, senior staff were able to see that support and credibility for the idea was widespread. The respondent was convinced that had it not emerged at the retreat this idea and its proponent would have ended up as a "voice calling in the night."

In the previous case, one informant described a very similar situation, relating to the quick action of executives when they heard about the voice mail business opportunity. In both this case and that

one, one could not be faulted for pointing out the degree of "serendipity" in those outcomes. Chance events will always place some role in innovation but it appears that more was at work here. In both cases it appears that the strategic intent of the organization -- defined by Hamel and Prahalad as ambition coupled with focus, motivation, freedom, flexibility, and consistency -- gave employees a clear understanding of which ideas were acceptable, which ideas were not, and the importance of bringing forward those that were required for growth or competitiveness.

These comments also illustrate the importance of 'field production' of a service as a crucial element in the development decision. As senior management knew, getting a new way of banking implemented involved a certain amount of headquarters-based design and marketing but the product ultimately had to be created in the branch. If branch managers were not enthusiastic, the product could not be successful. The retreat not only provides a venue for hearing about ideas from the field but it also allows headquarters staff the opportunity to field test ideas with the ultimate producers of their 'product'.

The retreat venue in a sense provides a non-threatening site for priority setting in an informal yet rich way. Although everyone comes to a decision situation with a certain level of bias, the biases are diluted considerably in a larger setting like this.

Observations/Dimensions of Innovation

This case illustrates several aspects of the pre-development, or concept formulation, innovation process for services. Observations are organized into the following categories: the role of frequent, informal

communication; the role of teams; the benefits of a 'flat' organizational hierarchy; the role of information technologies for innovation; the importance of trust and a feedback process that guarantees that participants see that innovative ideas are implemented; rewards so that the originators of the ideas get the recognition they desire and deserve; benefits from top management involvement; the utility of a clearly stated and widely disseminated strategic plan.

Informal communication

Communication for innovation at OP Finance is largely informal. In developing the Telephone Service application, the branch manager who championed that process used personal interactions in order to ascertain the appropriate 'angle' to sell the board of directors on the plan. She was not assigned the task of developing new services and she was not part of a task force or initiative. Similarly, the 'price of admission' idea exchange evolved out of a fun team building exercise at an informal retreat for branch managers. When the managers got involved in personal and then team-oriented presentations these, too, are relatively informal activities. The creation of teams and the meetings that preceded the retreat were informal, and sometimes held after business hours. Another example of the importance of informal communication occurred when the Total Service team made its presentation at the retreat in the form of a skit.

As with the pizza service pay telephone whipped up by two managers and a programmer, the skit also illustrates the importance of "making the intangible tangible" -- taking concepts and ideas and putting them in front of others in a way that they can be easily understood and evaluated. Services present a special problem in this regard, there is

often little "gear" that you can create a model for or "get on the bench" in a mock-up. The fact that a service is often a performance precludes a favourite of the new product designer, the non working model. Nevertheless, individuals and teams who are given the tools, the opportunity and the self-confidence (it is hard to imagine a more difficult task for a group of bank managers to undertake in front of their peers than to play act a new service rather than present it in the form of a report with tables and figures and lots of numbers) can achieve remarkable feats.

In all three cases (Telephone Service, innovation in retreat, idea exchange) communications within the innovating unit (individual, group or team) as well as between the unit and management was informal. The informality was beneficial in and of itself and it allowed for repetition.

Frequent communication

Because communication among team members was informal (telephone calls, after office hours meetings, weekend retreats, unassigned projects) there was less incentive to restrict the frequency of interaction. People subjected to repeated meetings often complain about the amount of wasted time, but in the cases described here, people communicated as and when needed, without regard for immediate outcomes. In the retreat, for example, people were able to talk about the posted ideas over the course of the weekend in as many instances or ways as interested them. As a result, the appropriate course of action, or the consensus of the group emerged gradually.

Teams

Teams are described as the panacea for myriad management problems. At OP Finance the use of teams for 'retreat' presentations emerged in an unusual way, and for slightly different reasons, than is normally the case. First of all, the teams were self-created instead of being assigned. Second, the teams were created at least in part to provide moral support and encouragement for people unused to contributing to an innovation process. In both cases the teams allowed people without the innovation infrastructure that might be found in an R&D or marketing department to respond to the complexity and uncertainty inherent in the innovation process. (Teams also served the more usual function of distributing the workload and enabling the simultaneous application of a broad range of skills.)

Although the short time frame and limited responsibilities of the groups at OP Finance might stretch the definition of team, the participants identified themselves as a team and continued in communication after the presentation. The literature on team work frequently cites the continuity of a team as a key success factor. Advocates of this suggest that the same team members stay involved from conception to deployment of a new product or service. At OP Finance, two of the team members' used their branch to implement the proposed service on a trial basis.

'Flat' organization

OP Finance's relatively flat organizational structure affects the innovation process in several ways. Because there is not a large headquarters staff with departments and functional expertise, the planning group must rely on all employees to pursue innovation in their

jobs. By turning a retreat into an innovation exercise, OP Finance's management has extended their concept formulation capabilities much wider than otherwise could be accomplished. By giving the teams a short time-frame and no resources, branch managers are forced to develop linkages with their staff and with headquarters resource people to get the answers they need quickly. The result has been branch staff that feel encouraged to develop innovative ideas and bring them forward and branch managers who have developed downward linked relationships with headquarters staff for information. This latter configuration is unusual in a more traditional command and control organization but it is precisely the kind of relationship that a flat organization must foster in order to prove the worth of headquarters staff.

A flat organizational structure also raises the possibility that communication will be difficult and strategic directions become unwieldy. The initial experiments with innovation at the retreats demonstrated some of these problems as a large number of individuals presented topics that were often not tied to company direction. Instead of dealing with this through directives and committees, OP Finance first emphasized team work and then backed those up with information technology suited to the task.

Information technologies (voice mail, e-mail)

Many observers suggest that the key to effective work group collaboration is efficient use of new forms of information technologies. With the Telephone Service as an example of how information technology can improve customer contact, OP Finance has proceeded to implement voice mail and more recently e-mail on a wide scale throughout the company. Information technology is used at several stages in the

innovation process at OP Finance. For example, reminders for meetings and suggestions for topics for teams are circulated via voice mail lists. Team members used voice mail during the preparation stages of their presentations to coordinate their activities since they were not co-located and were mainly working after hours. Electronic mail and file sharing via e-mail and disk sharing ("sneakernet") were also used.

Trust and links between innovation action and management action

One of the significant impacts from OP Finance's incremental approach to innovation management has been a sense of trust among the participants. The manager interviewed for this case indicated that he was confident ideas proposed at the retreat and in other venues (the company also has suggestion box programs and so on) would be implemented. The trust was created by identifying useful innovations in a public forum and then acting on them immediately. Although less significant in terms of service innovations, the suggestion box program and the associated awards dinners, ceremonies and prizes all serve to reinforce the theme that new ideas are welcome. When branch managers were asked to create a presentation about the unique aspects of their branch and turned to their staff for help, another form of trust was fostered between the manager and his staff and a link was created between the staff and the change process.

Top management involvement

Studies on organizational change have repeatedly shown that top management involvement is a key component in success. The innovation process is no different and the role of top management is particularly important. In the case of OP Finance, the chief executive was supportive of the Telephone Service project while making sure that its proponents

could justify it on grounds acceptable to the business. The chief executive attended the first and every subsequent retreat organized by the branch operations department. Significantly, at the first such meeting he accepted a suggested new idea and saw that it was implemented almost immediately. This not only established the innovation credentials of the process to the participants but also to the rest of the company, prompting demand from other senior managers to attend subsequent sessions.

The chief executive and other managers also made their involvement informal. As discussed earlier, informal communication is sometimes crucial in order to get across the nuances and ambiguities of a new idea. Often the act of describing an innovation is a creative act in itself, as ideas spill out and are either reinforced or modified by the reaction of the listener. Top management at OP Finance became involved in these processes and in a hands-on and informal way. This allowed them to see changes that needed to be made and implement them quickly.

Iteration

One of the characteristics of the innovation process at OP Finance, typified in the retreats, is the iterative way in which they have been developed. The process started out small, no more than some "who are we" speeches by branch managers and ideas typed up on cards as a game to break the ice at a team building retreat. The value emerged by building up the process by building on success and making modifications as necessary to ensure that it remained a fun activity for everyone involved.

One of the informants noted that the key to new service development was to get something, no matter how small, out into the hands of

customers and then work on it, improve it and refine it. At OP Finance the same approach appears to have been taken for the innovation process itself as refinements were made on the role of innovative ideas at the annual managers' retreat.

Feedback

The only way to iterate a process is through feedback. Much of the feedback that led to success at OP Finance was informal. No outside consulting firms were called in to analyze the process and make recommendations, no task forces and briefing documents were prepared. Only slight modifications based on discussions with the participants. In a way, the concept of informal communication both presumes and delivers effective feedback. OP Finance has encouraged their staff to provide feedback and has in turn given them feedback in terms of actions and implementations of ideas.

Strategic plan

The role of the strategic plan as more than a slogan played a significant part in the innovation process at OP Finance. When the strategic plan was described in interviews it was as a working document that one could use to derive guidance for steering a new idea or topic. Team members were able to use it to quickly establish the merit of their ideas. The total service team used the strategic plan to position their idea and justify recommended changes.

Skit

One of the most common distinctions between goods and services is the amount of intangibility in a service. In the innovation process, intangibility has meant that it is sometimes difficult to adequately describe a service in a formal document. In addition, services are often

produced at the same time they are consumed (simultaneity). As a result, it is difficult to convey the value of a service without demonstrating it being consumed as well as produced. For both of these reasons, the choice of a simulated service through a "skit" was a astute move on the part of the Total Service team. They were able to use the format of a play to impart the intangible benefits and the role of the consumer of the service in a way that would have been impossible or overly time consuming in a document or slide presentation.

The skits were a way of "prototyping" or simulating the new service (visualization). The team members were communicating by taking assumed roles (beyond their usual ones) to highlight relationships and dependencies in the new service. The complexities of a new service calls for the use of a rich medium of communication.

Access to new technology

Services frequently rely on new technologies to achieve their potential. In the modern economy a typical service business is highly capitalized and utilizes the latest in modern technology. Several authors have remarked on the ability of users of technology to put products to uses that were not foreseen by the original designers.[7] The total service team included two members who were part of a pilot test of a new member service computer system. Their access to this system and awareness of its potential allowed them to identify ways in which it could used to augment and support their new service concept. This example demonstrates how the practice of 'pilot testing' of new systems achieves more than the first order impact of identification of flaws in design or implementation. Field users who face unique problems will not only provide valuable feedback on what a next generation version of the

technology could do for them but will begin to envision how the technology could be used in the creation of totally new products and services.[8]

Cross-Case Comparison

Many aspects of the OP Finance case are comparable to the other financial institutions studied for this research. In size it is a little smaller than the chartered banks but ranks favorably with the regional banks that typify the U.S. market. In terms of employees and customers served it is quite a bit smaller than even the smaller telecommunications companies discussed earlier. Several aspects of the innovation process are similar to other "innovative" service companies. The origins of its use of teams were unique in the relatively small sample covered by this research but the results were comparable in many ways. Interestingly, the time allotted to concept formulation was short in many cases. In the case of Total Service, the concept was articulated in the space of a month and a pilot test was underway in less than three months.

The OP Finance case, as well as those in Chapter 8, reflects pre-development activities that do not include a systematic approach as used by "champions of innovation." The remainder of this chapter provides a step-by-step comparison of the various techniques used in all the chapters and compares them to each other and to published reports on the technique.

The first two case studies (chapters six and seven) presented formulation techniques that used the champions of innovation technique explicitly. The cases presented in chapters eight and nine used

alternative techniques. The tables which follow compare each of those cases according to similarities, differences and substitutions.

The "standard" for champions of innovation is the technique as described by Bailetti and Guild in their 1991 paper, "A method to generate promising opportunities for new product development in rapidly changing industrial environments" (Bailetti & Guild, 1991b). This paper identifies seven steps in four stages. The steps included in the table are idealized versions of those used in the most recent application of the technique, at ABC Tel in 1991-92. Each step is discussed separately with a commentary following the comparisons.

Cases are identified in the tables by letter. ABC Tel is "A", DEF Research is "B", the first GH Tel team (voice mail) is "C", the second GH Tel team (electronic branding) is "D", the first GH Tel supplier (voice mail equipment) is "E" , the second GH Tel supplier (new pay telephones) is "F", and the financial services company is "G". The Bailetti and Guild process as reported in *R&D Management* (1991) is "H".

Step 0: Team with Mandate

In this stage the team is formed and assigned a mandate from senior managers. Key sub-steps include: identify multidisciplinary team with absorptive capacity for further learning; look for key competence carriers who will be missed from other assignments; identify and agree on application areas of interest: unbridled but not uncorralled teams; new product concept investment criteria established up front; senior management convey mandate and commit to "acceptor" role; at start, team members choose in or out.

Table 9.1: Cross-case Comparison (Step 0)

Case	Similarities	Differences	Substitutions
A	As described	In retrospect, the investment criteria and acceptor roles were not emphasized enough	n.a.
B		Teams tended to be from similar functional backgrounds	
C	Unbridled formulation activities	Team emerged gradually, no explicit investment criteria	Idea came from staff member, organization had strong strategic intent as a substitute for explicit investment criteria
D	Unbridled formulation activities	Team of two, initially	Idea came from senior manager
E	Opportunity was congruent with senior management objectives	Activity was unexpected	Change process was kicked off by outside influence
F	Used a "gated" development process; multifunctional team involved	Did not have an explicit formulation process; team used people from several organizations (subsidiary and related companies)	Customer "wish list" substituted for mandate
G	Teams, senior manager acceptors, mandate from the top	Team members were peers, few functional or technical differences	
H	Not applicable -- the technique originally began with "step 1". The mandate and sponsorship were taken as a given.		

This step was added to the ABC Tel case because of problems in previous instances of the technique. Interviews with team members of other teams at DEF Research indicated that the most recent applications

of the technique there also emphasized this aspect. Team members and especially team coordinators appeared concerned that sponsoring managers be explicit about what the objectives were before the team set out. The implied fear was that expectations would change while the team was underway and the impact of the recommendations would be lost. Teams at GHTel appeared to avoid this problem by engaging in frequent informal communication with their superiors -- if expectations changed, or they were not meeting existing expectations, they learned about it quickly.

Although there was formal discussion of budgets in the ABC Tel case, misunderstandings nevertheless emerged around the terms of the travel budget. A corporate reorganization also put pressure on the team to reduce its expenses mid-way through the process. The less formal approaches did not have budget problems, although mostly because they had no budget at all.

Step 1: Scan for Cues

At this stage the team begins its environmental scan: they scan technical, semi-technical and trade journals, first manually and then electronically; they identify innovators in application areas of interest; their manual and electronic scan of 20,000 articles can yield 500-700 innovations and 200 champions of innovation by reviewing the last six months of 20 to 30 journals; they select champions of innovation for visits; they capture their embryonic ideas in the form of a "strawman" document.

Table 9.2: Cross-case Comparison (Step 1)

Case	Similarities	Differences	Substitutions
A	As described		
B	As described		
C	A scan was performed, outside contacts were identified.	The scan was informal and unsystematic, contact was mainly mediated (telephone calls) or opportunistic (met at conference, trade shows)	Substituted vendor discussions for search for technology champions, used trade show instead of special site visits
D	Scan was conducted, outside contacts identified, direct contact was made with champions; used a presentation similar to the "strawman" document	The scan was informal and unsystematic; screening method for contacts was "gut instinct"; some of the calls were explicitly "sales" calls -- the team was looking for partners, even though they weren't quite sure what the product was	Looked for "industry leaders" rather than champions
E	Leading customer suggested opportunity	Customer initiated contact	
F	Leading customer suggested opportunity, made direct contacts	Scan was informal and unsystematic; scan was limited to similar businesses in geographically different markets; utilized mediated communication (telephone calls) for data collection	
G		No "strawman" statement	
H	As described		

Scanning the environment is something that "gatekeepers" do as a regular part of their job. The differences introduced by the "champions

of innovation" technique are intended to focus the objective of that activity, compress it into two weeks, broaden the scope of the scan and do it as a team activity. Compared to the other formulation activities probed in this research, it accomplished all those goals.

The team members in the ABC Tel case all indicated that the environmental scan was both novel and valuable to them. They reported some social discomfort at being seen to be "reading on the job" but it was a minor concern. They all indicated that it was a valuable activity, one they would do again if they were do undertake such innovation activities. Respondents from the other case that explicitly used the "champions of innovation" technique reported similar satisfaction.

Step 2: Direct Contact

At this stage the team makes telephone contact and introductions, they have a travel budget of about $50,000 and using a list of 200 champions they select 40 for field visits. A high proportion agree. The team visits and carries out two-way exchanges. When they return from the visits they synthesize their learning in trip reports and strengthen their emerging concepts in discussions.

Table 9.3: Cross-case Comparison (Step 2)

Case	Similarities	Differences	Substitutions
A	As described	Some restrictions on travel	Added experts from other (related) company for site visits
B	As described	Trip reports tend to fall to team leader	
C			Direct contact with developers of thematically similar but technically different service within the company -- innovation by historical reference
D	Direct contact	No trip reports; gradually focused their direct contact as opposed to starting with a list and seeing them all	Interspersed direct contact with prototype development
E	Direct contact with customers	No trip reports, no supplier contact (in this case), rapid involvement of senior management	
F	Direct contact with customers and suppliers	No trip reports	
G	Senior managers reported on their direct contact with innovators (another financial institution)	No formal environmental scan; little direct contact; no travel budget	Seminar and workbook from consultant provided information, suggestions
H	As described		

The direct contact with innovators has no ready equivalent among the other practices in the other cases. Some people made use of direct contact during conferences and trade shows, but none of it was as targeted and concentrated as the ABC Tel team experienced. The most

striking difference between the champions of innovation approach and the others was the effort to ensure that a team met with innovators. This required considerably more effort and expense but it ensured that the team was able to absorb as much as possible from the champions and that the enthusiasm generated by a visit or an insight was spread through the team. The closest equivalent was group "D" -- the electronic branding group at GHTel. This two person team did visit a number of exceptional innovators both in supplier and potential customer companies. They were also the most familiar with the work of von Hippel at MIT.

Step 3: Group Creativity

This step manages the team's creativity after exposure to innovators. The first sub-step is to provide team members with individual access to computer mediated initiation of concepts. The second sub-step is to undertake some non-evaluative brainstorming. The third initiative is to have a critical discussion within the team in order to generate 20 to 30 concepts which the team collectively agrees on. These are then rank ordered by apparent opportunity. This takes place in a "retreat" atmosphere, with the entire team sequestered for an entire week.

Table 9.4: Cross-case Comparison (Step 3)

Case	Similarities	Differences	Substitutions
A	As described		
B		No computer mediated concept initiation	
C		No rank ordering of concepts	"Green door" sessions equivalent to brainstorming; voice mail circulation of ideas
D	Brainstorming sessions	Two or three people only at most sessions. Involved senior manager	Informal discussion groups
E		Single concept focus, rank ordering not an issue	
F		Team rarely together all at once	Voice mail "discussions"
G	Team brainstorming sessions	Shorter duration, longer interval (a few hours over 2-3 weeks)	
H		Much less detailed approach, no computer usage by team members	

The activities in step three are also unique among the cases studied. None of the other teams or organizations made use of computer mediation in the collection of concepts. Some of the groups did use voice mail to circulate ideas among a group. The other groups did not make use of a week-long closed door session, although one group did meet intensively for shorter periods over a longer time span.

Step 4: Screening Concepts

At this stage the team begins an opportunity screening process, looking to determine the scope of the business attractiveness by

applying established criteria. The team hope to be able to estimate relative opportunities and achieve an "80 per cent" answer to many of the questions which would arise in creating a business plan.

Table 9.5: Cross-case Comparison (Step 4)

Case	Similarities	Differences	Substitutions
A	As described	The "established criteria" were not clearly established before the team began and instead emerged as the team worked on the problem	Company specific requirements for business opportunities
B	As described	Tended to be applied more by team leaders than by the whole team	
C		No equivalent step	
D		No equivalent	
E		No equivalent	
F	Similar process	Not a team activity. Separate activities in the three participating organizations	
G		No equivalent	
H	As described		

The opportunity screening by the team was something initiated by Bailetti and Guild but was not closely adhered to in later implementations at the same firm. When the guide was applied at ABC Tel, team members felt that it was not quite right for their organization and they modified some of the parameters of the screening guide to make it fit more closely with the anticipated demands of their management. Other organizations in the case study did not use such a process at all, unfortunately.[9] The closest thing to a screening guide was the awareness

that the two teams from GHTel had of what an opportunity was for their organization. They indicated that they knew very well the scale of initiative that was required and the areas of business that fit with the company. This informal awareness of principles acted as a screening guide for their innovative activities.

Step 5: Investment Decision

At this step the product opportunities are tabled with the potential acceptors for an investment decision. The goal is to have one or two specific formulation team innovations initiated. The team presents their results, focusing on the best one or two opportunities. The team is asking that a formal business plan and commercial specification begin. The key team members should carry into the development process. If external relationships created in the direct contacts need to be formalized they would be done at this stage.

Table 9.6: Cross-case Comparison (Step 5)

Case	Similarities	Differences	Substitutions
A	As described		
B		Team leaders made the presentations separately. This was not a step in the process at the time	
C	Team presented one opportunity, key members carried on into development	Less team emphasis on business plan, more on 'make it work'	Gradual evolution from product idea to prototype to pilot to field trial to commercial service
D	Team presented one opportunity, key members carried on into development	Less team emphasis on business plan, more on 'make it work'	Gradual evolution from product idea to prototype to pilot to field trial to commercial service
E		Product idea was handed off to development team	
F		No alternatives presented, idea was partially handed off	
G	Team members involved in field trial	Presentation was to peers as well as senior management -- including CEO	
H	Not applicable		

The investment decision as a formalized step, where the team presents to management, was an add-on to the process when it was "ported" to ABC Tel. Previous implementations at other companies suggested that while good ideas could come from a team they had to be pushed forward into the next stage and a development decision was the way to make that happen. In its original format this was not a step considered by the technique, the results were passed on to the technique's sponsors with the

knowledge that they would make the necessary presentations and arguments. Interviews with the teams from DEF Research indicated that this aspect was problematic and that in the absence of a forceful team leader the ideas could end up un-used or under-used.

Some organizations either did not require the team to undertake this step because the formulation activity began with a senior sponsor ("C" and "D" and "F") or it was captured by senior management in a more informal way ("E"). In those cases the formulation melded seamlessly into the development process. In case "G" (OP Finance) there was a presentation of ideas but it was to the very highest level of management and as a result the next steps occurred very rapidly. At ABC Tel, the team found that their presentations were made to a group of managers who would have been responsible for making a new service a success but who could not make a development decision. The enthusiasm generated by the team and its presentation was possibly lost in subsequent presentations where the opportunities were reduced to numbers.

The intent of the champions of innovation process was to have team members carry forward to the development process and in fact two members of the team in line "A" carried forward to further develop the idea. This also occurred in situations without the technique, however, as team members at GHTel and OP Finance remained involved in the development activities in their respective organizations.

Endnotes

[1] In Canada, a credit union operates under rules only slightly different than a chartered bank and is owned by depositor/members.

[2] A category of "Regional Branch Manager" exists but this is normally carried out by one of the Branch Managers as a part of regular duties. As such he or she have more of a collegial than reporting relationship with the other Branch Managers in the region.

[3] The author interviewed Larry Wald, Vice President, Sales, George Scott, Vice President Marketing and Planning, and John DeRose, Branch Manager to learn more about the role of the retreats in service innovation at OP Finance.

[4] Although the branch managers are flattered to have drawn the attention of the senior management, there is a sense that the team building aspect of the retreat might get overwhelmed by the participation of all the managers. The solution that emerged is that the retreat was extended for an extra day and only the branch managers stay for that extra day.

[5] This could be the process or the organizational climate at the time. The two must have interacted, because he referred to initially being reluctant to say things to Bob Quart (CEO) in the early days (3 years ago) and later feeling that Bob really listened to the ideas from the branch level (now).

[6] According to both the Branch Manager involved and the VP Planning who oversaw the process, the "total service" team of 1993 was so committed to their idea that they began plans to field test the idea almost immediately. Some fast action was required on the part of the senior planning managers to get a few measures of performance included in the trials. The two managers selected to introduce the service have also done so using their own budgets - a considerable undertaking since the service requires remodeling the bank to a certain extent and an extra person on the floor at certain times. In the case of the branch I visited, this has resulted in extra work for that employee as well.

[7] See Udwadia's paper on customer 'co-construction' of new products and services (Udwadia & Kumar, 1991). von Hippel's lead user method and Bailetti and Guild's "champions of innovation" both take advantage of the ingenuity of leading users of technology to identify next generation features and functions.

[8] Ultrasound technicians provided with 'next generation' sensing tools as part of a clinical trial began to use them to deliver the unanticipated benefit of 'non full bladder' scanning - a feature that pregnant women soon came to demand.

[9] Kuczmarski's research suggests that opportunity screening is one of the most underutilized yet powerful tools available to new product developers. See especially (Kuczmarski, 1993).

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Chapter Ten

Conclusion

Telecommunications services, and the innovation processes which support them, are entering a transitional phase. The transition is occurring because of the industry's position in the centre of a vortex of change brought on by market shifts, technology breakthroughs and regulatory upheavals. Richard Barras wrote about a similar transition phase in the financial services industry in Europe. Barras argued that vanguard services such as finance and telecommunications display a reverse innovation curve (Barras, 1986). That is, instead of a progression from revolution to evolution as seen in manufacturing industries, services display a tendency toward early incremental changes followed by more striking shifts to business practice and positioning. Barras was referring to the use of information technologies in financial services. He pointed out how the early applications of computers had been to automate existing processes. It was only much later that banks began to deploy information technology in a way that altered their business.

If the Barras theory holds for telecommunications services, then the changes which lie ahead will fundamentally alter the business model used for new telecommunications services. The evolutionary changes in telephone technology are in place, laying the groundwork for revolutions in telecommunications services. The Advanced Intelligent Network, for example, will allow telephone companies *or their customers* to rapidly deploy new services simply by reprogramming the software that runs the network (Stahl, 1994).

Telephone companies over the last several decades have been largely engineering driven and constrained by the mandate to deliver a highly reliable basic service at reasonable rates. When the network was based on analog and mechanical technology this meant very slow and considered movement to new services -- everything had to be physically constructed and then amortized for periods of as much as twenty years. A digital network controlled by software can be re-configured much more easily and with little capital cost. Regulatory barriers are no longer the absolute that they once were. As a result, telephone companies and telecommunications customers are demanding new services at a rapid pace. It is therefore more important than ever to have an effective system in place to manage the process of identifying and screening significant new business opportunities.

The case studies and literature review presented in this thesis are a step in that direction. This chapter draws upon both of these as sources for observations, recommendations, and suggestions for further research.

Observations are grouped around eight topics: maintaining strategic intent while innovating, the importance of a "strawman" statement, managing gaps, the role of a "mock-up" in service innovation, and team members as champions. The chapter concludes with comments on what the researcher would do differently next time, further research and a final comment on the spirit of innovation.

Strategic intent

In the GHTel and OP Finance cases, teams were able to propose innovative business opportunities in apparently "fortuitous" situations. Perhaps their good fortune was of their own making. Hamel and Prahalad

speak of "strategic intent" -- the artful combination of ambition with focus, motivation, contribution, enthusiasm and consistency -- as a new standard by which strategies will be measured (Hamel & Prahalad, 1989).

> Strategic intent envisions a desired leadership position and establishes the criterion the organization will use to chart its progress.... At the same time, strategic intent is more than simply unfettered ambition....The concept also encompasses an active management process that includes: focusing the organization's attention on the essence of winning; motivating people by communicating the value of the target; leaving room for individual and team contributions; sustaining enthusiasm by providing new operational definition as circumstances change; and using intent consistently to guide resource allocations (Hamel & Prahalad, 1989:64).

In the cases referred to above, the firms demonstrated a practical ability in mustering and making use of strategic intent.

To understand strategic intent better, and see how it fits with the innovation process we can compare it to previous modes of thinking about strategy.

Table 10.1: "Traditional" versus "emerging" strategic thinking

Dimension	**"Traditional"**	**Emerging**
Emphasis	strategic fit	strategic "stretch"
Response to Limits	trim ambitions	leverage resources
Method to gain advantage	search for sustainable advantages	learning for creation of new advantages
Reaction to competition	seek out niches	seek new rules that break opponents
Approach to balance	portfolio of businesses	portfolio of advantages
Management approach	product-market units	management of cross-functional core competencies
Consistency driver	financial targets, operating procedures	allegiance to strategic intent

Hamel and Prahalad compare and contrast innovation strategies that emerge from these differing approaches to strategy. In the traditional perspective, innovation is an isolated activity, dependent on the activities of teams whose activities are not coordinated or directed toward ambitious goals. As a result, opportunities are missed in the tightly constrained "planning formats, reward criteria, definition of served market and belief in accepted industry practice" (Hamel & Prahalad, 1989:66).

The teams at ABC Telco and DEF Research were able to identify new business opportunities for their respective organizations but in interviews and questionnaires they both expressed misgivings about their firms' ability to capitalize on those opportunities. Moreover, the teams both had difficulty comprehending the innovation process outside of the team or understanding the choices management inevitably makes in selecting opportunities. This incomprehension not only leads to disappointment but it is also evidence of inefficiency -- team members who don't understand the process in hindsight will not be able to pro-actively seize on opportunities when they come upon them.

The contrasting situation, which was evident in both GHTel and OP Finance, is the one which gives rise to the statement about innovation being unbridled but not uncorralled: "top management establishes the criterion against which employees can pretest the logic of their initiatives" (Hamel & Prahalad, 1989:67). The GHTel teams both stated in interviews that they understood management strategy and on at least one occasion for both teams that understanding enabled a team member to capitalize on an opportunity by taking action he or she knew was implementable.

It is not the role of a formulation technique to establish and sustain the strategic vision of a company, but the absence, or imprecision, of such a vision makes formulation activities much more difficult. Some would argue that "strategy" as a whole is in decline. Mintzberg's recent review of the literature on strategy documents the rise and fall of strategic planning in North American business circles (Mintzberg, 1994). These comments should not be interpreted as an attempt to reverse the tide in that regard. Rather that innovation strategies be integrated into whatever mechanisms are put in place to replace strategic planning. Rapid innovation using the formulation techniques described here goes a long way to avoiding some of the excesses of strategic planners by allowing the organization to "plan" through action. Short response times lessen the need for long lead times. In Mintzberg's terms, we need to shift from strategic planning to strategic thinking.

Gaps

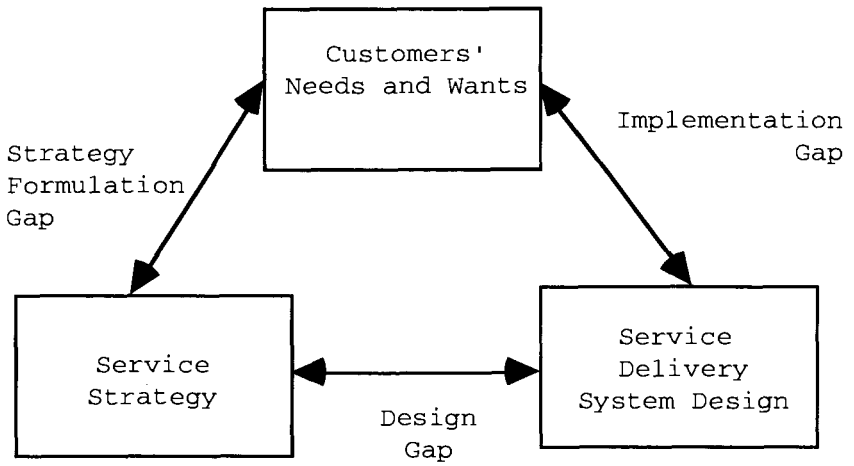
Short response times are also seen as a way to bridge gaps between what customers want and what the company has ready for them. Innovation includes pre-development, development, and deployment stages. Pre-development is the focus of this research, because of a lack of attention to this stage in the past and because it seems to afford an economical entry point to substantially modify innovation practices without exceptional cost. Within this pre-development stage, which some people have called the "fuzzy front end" (Smith & Reinertsen, 1991), the research revealed three important phases of innovation. In the first phase the organization makes a commitment to look for ideas and markets.

The boundaries for the search are also established at this stage. In the second phase a search is conducted and a market/idea combination is identified and operationally defined.[1] In the third phase, the organization commits resources to the development of the market/idea combination -- the innovation -- that has been identified and defined.

Gaps can occur on many dimensions. One of the most common is a time gap. In an ideal world there would be very little time in the gaps between innovation stages and a prudent manager would therefore pay attention to managing the stages themselves. The thesis research revealed considerable gaps in between these stages, however. In the ABC Tel project, for example, there was a two-month gap between the team's completion of their activities and their presentation of results. Following the presentation there was an additional gap as resources were mustered to convince the organization to proceed with one or more of the proposed business opportunities. In the DEF Research case, similar gaps were reported. At IJ Tel, on the new pay telephone project, a three year gap occurred between approval of the project by the customer and first product specification by the supplier. In this case in particular, the gaps consumed more time than the innovation process itself.

Chase and Youngdahl identified gaps as a key stumbling block in service design (Chase & Youndahl, 1992). Chase and Youndahl's work looked at three gap points: the "implementation gap" between customers' needs and wants and service delivery system design, the "design gap" between service delivery system design and service strategy, and the "strategy formulation gap" between service strategy and customers' needs and wants. A diagram of these gaps is provided in Figure 10.1.

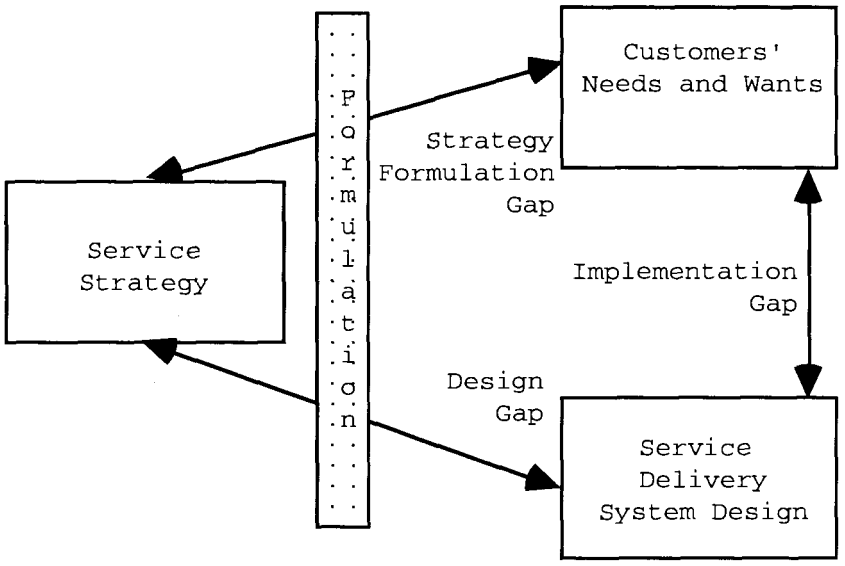
Figure 10.1: Gaps in the Service Design Process (I)



Adapted from Chase and Youngdahl, 1992.

Chase and Youngdahl's sketch of service design gaps is a useful overview of the entire process and it makes reference to "formulation" explicitly. Unfortunately their view on formulation is strictly as related to market ("customers' needs and wants") and does not take into account a holistic approach to formulation as proposed by the champions of innovation technique. A revised depiction of these gaps is found in Figure 10.2 with the role of "champions of innovation" highlighted.

Figure 10.2: Gaps in the Service Design Process (II)



Adapted from Chase and Youngdahl, 1992.

This diagram shows how a formulation technique such as champions of innovation can help bridge two gaps: 1) the gap between service strategy and service delivery system design (technology) and 2) the gap between service strategy and customers' need and wants (market). "Champions of innovation" may be an tool in resolving "design gap" and "strategy formulation gap" problems. "Champions of innovation" is not typically involved in the interplay between the delivery system and the market, however, and therefore has little to contribute to the implementation gap.[2]

Another writer who looks at gaps is Michael Porter. His "value chain" model also assumes careful attention to the gaps between stages in the value chain (Porter, 1985). Porter's analysis encourages new service formulators to think about the upstream and downstream linkages in a value chain. A successful new service will re-invent the pieces required to deliver a service. This approach was explored in the thesis research through an analysis of where teams looked for market and technology

inspiration. An operational definition of "upstream" and "downstream" was developed out of a review of the literature and an analysis of the value chains common in information technology and telecommunications. Although the lack of broad based data makes the results preliminary, the evidence suggests that this may be a useful tool to guide teams as they attempt to bridge gaps in the understanding of customers' needs and technology enablers.

The importance of value chains in service formulation is made clearer by recognizing the role of "final service functions" as predictors of the diffusion of innovations (Gershuny & Miles, 1983). Many economists and business analysts point to the "S-shaped"" curve of diffusion of new products as a predictor of new product sales. An innovative product typically has a period of slow growth then takes off in a period of high growth before returning to low or no growth once the market is saturated. A key question for innovation strategy is to know where on the growth curve you are and how you can anticipate jumping to the next curve before the current one peters out. From the perspective of the formulation team, the more important question is "why does it take off in the first place?"

Those who manage gaps well, or close the gap, can deliver a product that more closely matches the customer's expectations or hopes in terms of quality and price. Gaps can take many forms: it could be the delays in time that occur between the completion of one stage and the inception of another. It could be the gap between the vision of one group and the views of those who take the idea to its next stage. It could be the gap between the price the seller is hoping to receive and the price the buyer is hoping to pay. In the context of speeding up the innovation

process, one of the worst gaps is that of time, when some aspect of the process takes longer than what we might expect. Even more insidious is a gap of time in between stages. A time problem during a stage can be managed by improving the process. The actors and responsibilities are known and actions can be suggested and implemented.

The gap in between stages in the innovation process itself -- when there may be no one responsible (or responsibility is unclear) and roles are unknown or uncertain -- is more difficult to manage. One response to delays in the gaps could be to attempt to quickly extricate a project from limbo -- when it is neither approved or rejected or seek to avoid those situations altogether by enforcing a strict timeline on movement between stages.[3] One possible danger of a strict timeline is the loss of perfectly good projects that are simply ahead of their time. A solution to this may be to make decisions quickly but to put those ideas which seem to be good but for one reason or another are judged to be untimely into a separate stream for regular review and reconsideration.

A "strawman"

John Bateson has argued that innovators need a distinct set of service management skills. "Services," he suggests, have a fuzzy image, and because of this "consumers and marketers have no common point for discussing a service" (Bateson, 1979). This lack of a common point of reference is particularly acute for the formulation team as they face their managers, colleagues, and champions. The express purpose of a formulation team is to go beyond the range of usual variation in technology and market needs. Without a common language to discuss this

unfamiliar territory there is significant possibility of time wasting and misunderstanding.

One of the valuable tools in resolving this lack of a common point of reference is the "strawman" document the team created and brought with them on site visits. The primary rationale for creating such a document was to establish the team's credibility with external innovators. The team was urged to put their best thinking, both from the environmental scan and their own experience, into the document. The team was told that this would establish that the team was serious about their investigation and had done their homework before coming into the field. The strawman document had other benefits, however.

The first benefit from creating the strawman was its direct impact on the team. It was the first joint output by the team and as such represented a key team-building exercise. It also provided the team with an opportunity to develop a common vocabulary for the opportunities they were to encounter. The multidisciplinary and multifunctional nature of the team resulted in some quite diverse people, differing both in age and responsibility but also by department, previous experience, and education. The teams from ABC Telephone Co. were more diverse in this regard than those from DEF Research, and this seemed to be reflected in their appreciation of the strawman document. All of the members of the ABC Telephone company reported that it was both an arduous and a worthwhile task. DEF Research staff were not greatly affected by the task of creating a strawman document.

The second benefit from the strawman came soon after it was created -- it was used in an interim briefing between the team and their "acceptor" group. It served not only as a tangible output from an

intangible process (at the time of the meeting the team had done little but read magazines -- the environmental scan -- as far as their colleagues could see) but it extended the team's vocabulary to the acceptor group. Themes that they identified as being important were first raised in this forum and therefore a baseline for knowledge generation was established. In some ways this aspect of the process was handled only implicitly. The ABC Tel team did not make subsequent reference to the "strawman" document as evidence of what they had learned, but they could have. In one of the interviews with a manager at DEF Research, the importance of establishing the boundaries of what is known and not known at the beginning of a project was raised as an issue. According to that respondent, the danger is always present that a team will return with its findings and an acceptor will announce, "we already knew that." The leader of one of the DEF Research formulation teams spent quite a bit of time working with their acceptor group to establish the boundaries of their initial knowledge. The ABC Tel team did not have the same concerns but did use the strawman document more explicitly as a statement of initial knowledge.

The third important benefit from a strawman statement comes when the team takes it into the field to begin face-to-face contact with champions. The document again establishes the vocabulary of the exchange. The direct contact visits are very compressed and their is little time for misunderstandings or simplistic treatment of subjects the team has traveled considerable distance to learn more about. One of the practical benefits of the strawman document was that it provoked discussion and forced questions on issues that the team was anxious to explore. Many of the champions who were visited had a reputation for

innovation and it would have been easy for them to lapse into a formulaic response had the team simply asked for their views on the industry or the opportunities it presented.

On more than a few occasions, the visiting team from ABC Telephone company was told sincerely that their presentation was almost exactly what the people they were visiting would have said. This helped the team recognize they were on the right track in their investigation.

The creation of a strawman document was not a familiar activity for the ABC Tel team. The team members who participated in site visits reported that they were not only gratified to hear those remarks but felt that the presence of the document had enabled them to focus their own views within the team. They indicated that a strawman document was better than what they had done in the past (usually no document) and they would make use of one in the future.

Using "mock-ups"

It has just been argued that the strawman document was one way for the team to address the intangibility in their own activities. This challenge faces service developers in all sectors as they wrestle with the intangible aspects of their proposals and the difficulty in getting them across to their management and the public. The problem extends beyond intangibility, however. Lynn Shostack, a well respected commentator and practitioner in the business of developing new financial services, observed that "simultaneity" in services also makes it more difficult to create a models or "mock-ups" of a new services.

In order for people to make a realistic assessment of a new service, often the production process must be created in front of them, not just

an artifact. This poses special challenges to the service innovator.[4] While product developers often are able to focus attention with the use of a prototype, this bit of engineering sleight-of-hand is not generally available to a service developer. Several cases in the thesis research illustrate attempts by service formulation teams to overcome these difficulties. Some of these have been discussed in the cases themselves. Some of the examples include service developers who were able to take advantage of field trials by equipment provider partners in order to test their services. Others are tests of services anticipated by the equipment providers, even though they would not be the ultimate delivery mechanism for those services. Table 10.2 lists examples found in the case research.

Table 10.2: Making the intangible tangible -- case examples

Case/Chapter	Incident	Product or service	Standard Practice/ Informal
DEF Research/7	"Back of the limo" demo	Products	Yes[5]/Yes
GHTel/8	Pizza display on pay telephones	Service	No/Yes
GHTel/8	Test of home display telephones (ADSI)	Service	No/No
GHTel/8	Pilot test of "free" voice-mail	Service	Yes/No
MN Research/8	Field tests of pay telephone design	Equipment	Yes/No
OP Financial/9	"Skit" to describe new banking practice	Service	No/Yes

Although telecommunications equipment manufacturers and carriers frequently make use of market trials in the development of new products and services, only one of the above list could be described as a standard trial. The others were opportunistic, informal and, in the case of the financial services skit, an uncharacteristic departure from the norm in their business. These were opportunistic in the sense that they made use of resources that were at hand and typically did not require any incremental funding. Informal, as well, because permissions were not always sought to undertake the mock-up. A departure because they extended well beyond standard practice among their peers in other firms.

As such they illustrate three vital aspects of the process of making the intangible tangible. First, mock-ups are as much a necessity in services, especially if the new service is entirely unfamiliar to prospective customers or managers, as they are in products. Common wisdom about marketing on the ADSI phones, for example, was that it would be a resounding failure. "People don't want to have advertising on their telephones," experts warned the formulation team. As it turned out, people were very pleased to get information, savings coupons, and so on in their telephone. It was only in the process of creating a trial implementation that the value of the service to the customer actually emerged. As one respondent pointed out, all the easy services have been done, all the obvious ones have been implemented. In order to convince people to undertake the difficult and non-obvious services a special effort is required.

The special talents of those who undertake to deliver these mock-ups is the second point to be drawn from these examples. It was argued earlier, in the description of formulation techniques, that the very

best people are needed for this kind of undertaking. When it comes to implementing a test of real service, the skills and abilities of those people are heavily called upon. One of the abilities that is most in demand on such occasions is the ability to coordinate, cajole, and convince others to donate their time, equipment, and expertise to a project that has no official standing.[6] To the extent that these mock-ups are a way to gather otherwise unobtainable market information, as in the case of the pay telephones modified to allow one-touch dialing of a pizza service, they are illustrative of the special skills team members exhibit and special activities they undertake to span boundaries between the organization and external data on market (or technical) needs. Tangible intangibles are also used to convince co-workers and managers, as in the case of the skits performed by OP Finance team members.

This use of informal or unusual methods to make new service opportunities visible to management is an illustration of the third aspect of mock-ups that can be drawn from the examples -- the managers who tolerate or encourage these sorts of activities. The safest and easiest route for a manager to take when receiving suggestions is the "normal" one: reports with recommendations based on hard data. It appears from the cases that some managers are willing to extend their scope of acceptable results to non-standard formats, including the "skit" organized at OP Finance. Other managers give their employees the freedom to undertake unofficial trials of services as a way to explore concepts -- the pizza pay phones at GHTel.

If this attribute is advisable for teams, how might they be better equipped to deliver such results? One way would be to include "mock-up" skills in the set of desirable attributes of a formulation team member.

Depending on the opportunity area being targeted this might range from acting experience (which might have been useful at OP Finance) to computer programming (something the GHTel team made use of). A new generation of easy to use yet powerful software programs allows the creation of realistic three dimensional simulations of physical sites. Such software might be coupled with database programming and used to create a realistic interface to a new home banking system, for example. If these tools were sufficiently easy to use and could be installed on portable computers, teams may find themselves engaging champions in a creative process during their meetings. Or, a "brain-dump" session following a direct contact could turn into an opportunity to make the intangibles tangible.

The infrastructure support for teams, while it was not a direct research question in this thesis, is an area which could stand considerable improvement. Recent developments in hardware and software have made powerful portable computers affordable and capable -- something the 1991 teams sorely lacked. The simple addition of a video camera to the set of tools the team has access to could inject a much-needed "presence" into reports and presentations. The teams from ABC Telco and DEF Research both expressed frustration at not being able to convey their excitement and conviction that the selected opportunities were appropriate and timely. It is time that innovators made use of some of the tools that have already proven their worth among sales people, including multimedia presentations.

Computers are also emerging as essential tools in the on-going battles to gain an operational advantage over competitors. As Stalk, Evans, and Shulman have described, the movement in competitive

marketplaces is to competition on capabilities (Stalk, et al., 1992). One of the most effective capabilities, as demonstrated by retailers such as Walmart and IKEA is effective deployment of information technologies. Many of the barriers to the teams in these cases could have been ameliorated by better coordination capabilities. Extensive use of asynchronous communication -- such as e-mail and voice-mail -- might have helped the team focus their attention more quickly and allow them to retain a common perspective when some of the team members were distracted by competing responsibilities or could not meet for extended periods of time because one half of the team was on the road while the other was in the office.

Part of the problem faced by the ABC Telco team was originally intended to be a strength. It was thought that by giving the team their own physical space and computing resources they would be able to focus on the job at hand and have an opportunity to optimize their use of computing resources. The reality of the situation was that only one of the team members was assigned full time to the project and even he kept his office and his computer and phone line there. The others had to return to their offices for at least part of the week and it was there that they did anything that required computers. Although the participating researcher attempted to implement an enhanced computer system that would have helped collaborative activities, the system was not compatible with those used by the other team members and their systems were all very different from each others'. Even file sharing was a difficult task.

One of the successful uses of technology during the ABC Telco formulation probe was the ability of the participating researcher to

create documents on a large-screen computer while members of the team were gathered around and making suggestions. With simple yet powerful software such as "PowerPoint" the team was able to generate professional looking presentation materials as a group activity -- as opposed to having them sent out so they are done by someone else and result in a considerable delay.

Some of the respondents at DEF research were designers by training and had an appreciation for design software. One in particular would have liked to have been able to utilize computer software to a greater degree to bring the group's ideas "to life" in a form that others could appreciate. It is widely acknowledged that humans are visually-oriented -- a picture can help get across a concept that would take a great deal of words to express.

Another innovative use of information technology, which was discussed by the teams and was utilized to some extent by the author in conducting the thesis research, is to have "direct" contact without going directly to the people involved. Greater use of electronic mail for interviewing and contact selection as well as videoconferencing instead of travel could help to extend the reach of the team while reducing costs. An additional benefit would derive from the much broader potential audience for a videocoference call, for example, than could possibly attend a meeting in person. Information gathered electronically also lends itself more readily to archiving, sorting, indexing, searching and sharing.

Team members as champions

There is considerable discussion on the merits of "champions" as people responsible for driving change within organizations. The term

itself appears to come from Peters and Waterman's extensive surveys of exceptional firms throughout the world. Despite the widespread discussion of the benefits reaped by champions, some recent research has disputed the extent to which they are actually in use and effective. Some organizations see a champions as somewhat of a "loose cannon on the deck". The "champions of innovation" technique attempts to extract the value from other firms' champions -- by contacting them directly -- but does not formally address the issue of internal champions.

Informally the topic sometimes emerged, especially in reference to the likely impact on the team of meeting all those champions. Team members were cautioned that they might very well come back from the field so charged up and excited that they would want to head off to start their own company if the organization would not let them pursue their opportunities within the firm. In the case where the author was most closely involved this was most certainly the case, at least at first. Team members were very excited about their findings and could hardly wait to tell the acceptor group the recommendations. In preparing for those meetings, one of the members overstepped spending authorization to obtain a consultants' reports on the targeted industry and was subsequently reprimanded. When delay followed delay, however, and the prime opportunity was allocated to another committee for further study, interest waned and eventually all of the participants settled back into their former or new positions.

To some extent the technique depends on team members or their sponsors becoming champions as a result of the process. In the initial development of the "champions of innovation" process, the developers were also able to act as champions -- first for the technique itself and

then for the results it produced. In other circumstances it was not immediately apparent who would be the champion of the technique and its results. In the other cases, which used more informal methodologies, the very existence of the team or the innovation indicated the presence of an internal champion to some degree. This was most obvious in the role of the senior manager who assisted and initiated the "electronic branding" search at GHTel.

One of the difficulties of the recent application of the technique at ABC Telco relates to the ability of team members to become champions. The literature on champions suggests that one of the vital roles performed by champions relates to their ability to secure and protect resources needed by the team. This often takes the form of informal negotiation -- favours -- to obtain needed equipment or time or personnel. People who can perform those acts must, almost by definition, be tightly linked to their peers and the organization. In conflict with this reality, the multifunctional team at ABC Telco was created out of a number of different department and even included team members from a subsidiary company. As such, team members and the activities they were involved in were no longer directly connected to the flow of their home departments. It must have been difficult for them to draw on the resources and favours they required -- which tended in this organization to all reside in the departments -- if it wasn't clear how this would affect things back there.[7] In contrast, the two person team from GHTel that was exploring novel applications of display based telephones was able to draw on both their own connections and those of their sponsor to get modifications to equipment and software that allowed them to deploy a "pizza phone" with relatively few incremental resources.

What would the researcher do differently

If it were possible to repeat the research process, the researcher would examine the possibility of adding additional interviews or a survey, especially with senior managers. As the research progressed the importance of the "consumers" of formulation ideas took on increased weight.

The thesis research was to a large extent an exercise in grounded theory. The objective was to illuminate aspects of the innovation process for services that had not been considered previously. With this new knowledge it is now conceivable that the research could proceed with greater precision. If more previous work had been done it would have been possible to spend more time in the initial stages determining hypotheses and identifying ways in which to test them. To date, service innovation problems have resulted in relatively little research. Moreover, the results of the research have been mixed and of limited usefulness for someone interested in innovation from a communication perspective. As a result, there was not sufficient knowledge available to be absolutely certain at the outset what the appropriate questions were. Hopefully this research has contributed to that knowledge.

On a practical level a more complete description of the new product development/innovation process already in place at the field research site would be useful. With the limited resources of the student researcher, and the agreement that the research process not add delays to an aspect of the organization that was being targeted for time compression, this sort of analysis could not be completed at the time. Innovation processes are often not clearly articulated and even if they are that is not "how it really works". In order to minimize the impact

of such an investigation, this aspect of the inquiry would have to be carried out in parallel. This may imply a larger research team. The rationale behind conducting such an exercise would be twofold. First, it would give the investigator and formulation leader (whether or not they are the same people) a better perspective on the launch and reception of the formulation team's activities -- the boundary management issues described earlier as "box one" and "box two" problems. Second, the participating researcher may become too closely associated with the team's activities to be able to be neutral about the team's prospects -- both to him or her self and to the organization. A second researcher, studying the activity from the outside, could provide a sober second look at the activity and an opportunity to more closely monitor the "demand-side" of formulation of new product opportunities.

It would also have been worthwhile to conduct two types of surveys before undertaking research such as this. The first would be industry-wide, although it could be confined to a regional area if necessary. The objective would be to establish some norms of action for the formulation phase of new product development. This would have helped set the parameters for what was reasonable and possible to expect from a team and an organization.

The second survey would be internal to the organization. It would be an attempt to identify the scope and style of innovation within a company and help position a team's activities within a larger organizational context. Given the rapid pace of change and the accompanying turmoil in organizational structures it is hard to find a manual or rule book on something as uncertain as innovation processes. The survey would by necessity be informal and qualitative. It would have

to be done quickly, just before an activity was set to begin so that it was current.

What will be done next?

As a piece of exploratory research the present thesis has turned up as many questions as answers. This was to be expected given the combination of a relatively new field and the existence of studies which either contradict each other or report inconclusive findings. This aside, there are some obvious areas for further research. These are divided into three categories. The first are related to generalizing and extending the findings. The second category is related to modifications and enhancements to the "champions of innovation" process. The third is related research.

In the first category it is imperative to continue and extend the generalization efforts begun with the review of financial services firms into other vertical markets for information technology and telecommunications. One of the most interesting of these is services delivered by public electronic data networks such as the Internet. Some preliminary work in this area was started at the end of the thesis research and this needs to be completed and linked with the present research. Financial services are much more varied than the branch banking example described in chapter nine. Several more categories of financial services need to be covered, including insurance, wholesale banking, commodities brokerage and real estate.

Telecommunications itself continues to evolve and in particular the emergence of potential new entrants using the "wireless" technologies raises the possibility of the return of the small telephone company -- a

force that has not had a significant presence in Canada for many years.[8] The applicability and usefulness of "champions of innovation" techniques to these firms (or, for that matter some of the smaller regional telephone companies in Canada) would also be a first step toward a better understanding of how systematic formulation techniques can be used in small and medium-sized businesses. This question has come up frequently in the past two years and the researcher intends to make a concerted effort in that direction.

The discussion of "gaps" earlier in this chapter suggests a number of questions, including how to detect a gap and what techniques are most useful in bridging which gaps. One possible solution, described in the results, is the role of team members as internal champions. An interesting research problem may be to ask senior management to ascribe the role of internal champion to someone -- someone who will take responsibility for and carry forward whatever business opportunities the team eventually recommends. This need not be the person assigned to implement the methodology. Various leaders do emerge in the course of the team's activities, but rather than waiting for it to happen it might be instructive if a champion were pre-assigned. The objective would be to determine if this could help manage the "box one/box two" problems.

Part of the strength of "champions of innovation" is the extent to which the technique specifies that formulation activities be undertaken by "key competence carriers" within the organization. As part of the expanded role for a detached scientist alluded to above, the question of whether in fact the team actually has those resources could be addressed. A secondary question would be whether and to what extent those team members had been able to make use of departmental resources.

A comparison could be made between teams in which the leader came from within the organization and teams where the methodology was implemented by an outsider. A question to be asked in this regard is "Does the "not invented here" syndrome apply to "champions of innovation" and in what ways?"

In the second category, some of the enhancements of the technique will include refinements intended to lower the cost in order to make it more accessible to smaller firms (or budget conscious larger firms). One obvious area to explore is greater use of information technology not only in the acquisition and processing of information but for direct contact with innovators. Some of the tools and techniques that have been developed in the past two years have potential application for the formulation phase of new product development. One of these, the use of the Internet for environmental scanning, could be captured in software and made available at relatively low cost to small to medium sized firms.

Other extensions and refinements include managing the front and back end of the formulation process. At both the outset and the conclusion of the champions process, gaps were identified that could be addressed with more thorough analysis, or more complete documentation of the technique and its context. It might also be possible to include a higher degree of customization of the technique to suit the organization, the acceptor group and the nature of the opportunity area being explored. Within the technique, the 'opportunity screening guides' could benefit from a combination of customization and automation -- a software tool that allowed a "fill in the blanks" approach but where the blanks were based on a firm survey of information required to generate a development

decision. Both the criteria (static elements) and the process (dynamic elements) of opportunity screening could be scrutinized with an eye to strengthening them as well as tailoring them to the organization. Alternatively, we might investigate how the opportunity screening task could be removed from the team's agenda. Some sources suggest that there are relatively few "make or break" items for a new product development decision.[9] The confounding aspect is that, depending on competitive position, strategic intent, market demand, or technology drivers, the three or four items are not always the same. The science of opportunity screening lies in answering the questions well, but the art may be knowing which questions are appropriate.[10]

Formulation activities ultimately produce results if their recommendations are acted on. Some evidence in this research suggests that if the recipients of those recommendations are not sufficiently senior to act on the results then momentum will be lost and the "courage of convictions" dissipates. A useful piece of empirical research would attempt to link the level (director, vice-president, president) of management advocate at step five with successful outcomes.

Another extension of the technique would be to begin to address the question of skills required for a formulation team. It makes sense that if the technique is systematic and thoughtful in its components and objectives, we should be equally thoughtful in composing the team. Concepts such as "absorptive capacity" and "core competence" have been discussed in the context of forming a team but these need to be further operationalized and could include practical tools (such as a check list) that might be developed to aid the prospective team leader.

The third type of research is related and extensions to the overall objectives of the research. In this area the researcher would place further efforts to understand and then describe the innovation process as a communication activity. The study of creativity falls into this area as well as an exploration of the potential for a greater understanding of the role of complexity in creativity and innovation.

Another interest of mine in this regard is the link between innovation and larger questions such as competitiveness, sustainability, generation of wealth, and the quest for social justice. Innovation is an enabler for all four of these human aspirations but at least two -- sustainability and social justice -- are infrequent topics for innovation researchers.

The spirit of innovation

Considerations of a broader set of objectives for the innovative process brings me to the final point of this dissertation. It has been my experience, working with one team and interviewing dozens more, that like any human activity, innovation involves a great deal more than simply rules. Karagozoglu and Brown recently expressed dismay at the lack of empirical support for some of the most common prescriptions for innovation management (Karagozoglu & Brown, 1993). Their study attempted to explore with numbers what had previously been described anecdotally and in cases. Their lack of success in this should not come as a complete surprise, however. Recall the definition of innovation which began this dissertation: innovation is the application of knowledge to new tasks. As such, innovations are like children -- each one is unique, each one requires special treatment, each one has a life of its own.

Case studies of the "upbringing" of innovations should be therefore read not so much for the details and the procedures that were carried out but for the spirit with which those procedures were applied. This guideline is nowhere more obvious than in the cases from GHTel. Here a small group with limited resources and a relative disdain for formal innovation procedures has consistently "out-innovated" much larger organizations in their industry from all over the world. It appears that they do so because they capitalize on the inherent creativity in their staff. The company is able to tap this human capital not because of its close attention to a precise set of rules but by diffusing an ethos that rewards creative thinkers, provides clear goals for all to work toward and encourages frequent and informal communication throughout the organization.

Endnotes

[1] See Bailetti and Guild, as well as Keen (Keen, 1988) for illustrations of this concept.

[2] Much of the literature on "success factors" in service innovation seems to muddle the contributions of processes which contribute in various way and on various levels to each of these gaps yet focus on definitions of "success" that presume that the implementation gap has been bridged.

[3] Stalk and Hout note that in a case where one company was significantly faster through the development cycle than its competitor, it was not so much faster because of any big win in a single stage but rather the cumulative advantage of many 'half-step' advantages.

[4] In an article on the innovation process at consumer goods producer Thermos, Brian Dumaine describes the team's use of two mock-up barbecue's: an "ugly" one which worked the way they planned and a "stylish" one which looked the way they planned (Dumaine, 1993). Consumers were able to try the working one and imagine it looking like the other. Consumers don't care how the two ideals are merged. In services however, the fact that production and consumption are often simultaneous sometimes precludes this option. In the field of telecommunications, however, recent advances in computer technology and programming have allowed designers to "mock up" a telephone service. As one respondent related, the mock-ups have been sufficiently persuasive that one customer (a truck driver in an all-night truck stop) became irate because a call to his home was answered by the male "voice" programmed into the simulation. Bell Atlantic has even opened up part of their "Advanced Intelligent Network" (AIN) to customers, allowing outsiders to create telephone services for the first time (Stahl, 1994).

[5] Although prototypes and mock-ups are standard practice at DEF Research, it was unusual to create one designed for a presentation in the back of the CEO's vehicle.

[6] More on this in a separate point on "team members as champions."

[7] There is always the exception to the rule and some of the team members were able to commandeer junior people within their departments and get them to contribute to the team's activities.

[8] Notwithstanding the presence of a few small telephone companies such as Edmonton Telephones.

[9] A senior manager in the research and development subsidiary of a major electronics manufacturer pointed out that the "key questions" are few in number but never the same.

[10] The emerging practice of "backcasting" may be helpful in sorting out which questions will be important. The author has not had sufficient

exposure to this technique to do more than note it as a promising area for future research.

References

Abernathy, W. J., & Clark, K. B. (1985). Innovation: Mapping the winds of creative destruction. Research Policy, 14, 3-22.

Abernathy, W. J., & Utterback, J. M. (1978). Patterns of Industrial Innovation. Technology Review, June-July, 40-47.

Adams, J. S. (1980). Interorganizational processes and organizational boundary roles. In B. Straw & L. Cummings (Eds.), Research in organization behaviour (pp. 321-355). Greenwich, CT: JAI Press.

Adamson, R. E. (1952). Functional Fixedness as Related to Problem Solving: A Repetition of Three Experiments. Journal of Experimental Psychology, 44, 288-91.

Adamson, R. E., & Taylor, D. W. (1954). Functional Fixedness as Related to Elapsed Time and to Set. Journal of Experimental Psychology, 47, 122-26.

Aiken, M., & Hage, J. (1971). The Organic Organization and Innovation. Sociology, 5, 63-82.

Allen, T. J. (1977). Managing the Flow of Technology. Cambridge, MA: MIT Press.

Allen, T. J., & Marquis, D. G. (1964). Positive and Negative Biasing Sets: The Effects of Prior Experience on Research Performance. IEEE Transactions on Engineering Management, EM-11(4), 158-61.

Ancona, D. G., & Caldwell, D. F. (1987). Management issues facing new product teams in high technology companies. In D. Lewin, D. Lipsky, & D. Sockell (Eds.), Advances in industrial and labour relations (pp. 199-222). Greenwich, CT: JAI Press.

Ancona, D. G., & Caldwell, D. F. (1990). Beyond boundary spanning: Managing external dependence in product development teams. Journal of High Technology Management Research, 1(2), 119-135.

Ancona, D. G., & Caldwell, D. F. (1992). Bridging the Boundary: External Activity and Performance in Organizational Teams. Administrative Science Quarterly, 37(4), 634-665.

Anonymous (1993, January 4). Economic Growth: Explaining the Mystery. The Economist, p. 15-17.

Arrow, K. J. (1962). The Economic Implications of Learning by Doing. Review of Economic Studies, 29, 155-173.

Atkinson, M. M., & Coleman, W. D. (1989). The State, Business, and Industrial Change in Canada. Toronto: University of Toronto Press.

Bailetti, A. J., & Guild, P. D. (1991a). Designers' impressions of direct contact between product designers and champions of

innovation. The Journal of Product Innovation Management, 8, 91-103.

Bailetti, A. J., & Guild, P. D. (1991b). A method to generate promising opportunities for new product development in rapidly changing industrial environments. R&D Management, 21(4), 291-300.

Bailetti, A. J., & Guild, P. D. (1992). Absorptive Capacity of New Product Teams in the Telecommunications, Computing and Electronics Industries. In T. M. Khalil & B. A. Bayraktar (Eds.), Third International Conference on Management of Technology (pp. 136-144). Miami, Florida: Industrial Engineering & Management Press.

Bar, F., & Borrus, M. (1987). From Public Access to Private Connections: Network Policy and National Advantage. Paper presented at the Fifteenth Telecommunications Policy Research Conference, Airlie House, VA, September 27-30, 1987, Berkeley Roundtable on the International Economy.

Barras, R. (1986). Towards a theory of innovation in services. Research Policy, 15, 161-173.

Barras, R. (1990). Interactive innovation in financial and business services: The vanguard of the service revolution. Research Policy, 19, 215-237.

Batelle Columbus Laboratories (1973). Interactions of Science and Technology in the Innovative Process: Some Case Studies (Final report No. National Science Foundation.

Bateson, J. E. (1979). Why We Need Service Marketing. In O. C. Farrell, S. W. Brown, & J. Lamb C.W (Eds.), Conceptual and Theoretical Developments in Marketing (pp. 131-146). Chicago: American Marketing Association.

Bell, C. (1992). How to Invent Services. Journal of Services Marketing(Winter), 37-39.

Bell, D. (1973). The Coming of Post-Industrial Society: A Venture in Social Forecasting. New York: Basic Books.

Berry, L. L. (1980). Service Marketing is Different. Harvard Business Review(July-August), 158-165.

Berry, L. T. (1983). Relationship Marketing. In L. T. Berry, G. L. Shostak, & G. D. Upah (Eds.), Emerging perspectives on services marketing Chicago, IL: American Marketing Association.

Berry, L. T., Shostak, G. L., & Upah, G. D. (Ed.). (1983). Emerging perspectives on services marketing. Chicago, IL: American Marketing Association.

Birch, H. G., & Rabinowitz, H. J. (1951). The negative effect of previous experience on productive thinking. Journal of Experimental Psychology, 41, 121-26.

Black, A., & Parks, M. R. (1993). Rationale: Usenet Research Ethics Study (Gopher document No. 1). Communications Research Centre, Ottawa, Canada.

Bloch, T. M., Upah, G. D., & Zeithaml, V. A. (Ed.). (1985). Services marketing in a changing environment. Chicago, IL: American Marketing Association.

Booz Allen and Hamilton (1968). Management of New Products. Chicago: Booz, Allen & Hamilton.

Booz Allen and Hamilton (1981). New Products Management for the 1980s - Phase I. New York, NY: Booz, Allen & Hamilton, Inc.

Booz Allen and Hamilton (1982). New Products Management for the 1980s - Phase II. New York, NY: Booz, Allen & Hamilton, Inc.

Bowen, D. E., & Schneider, B. (1985). Boundary-Spanning-Role Employees and the Service Encounter. In J. Czepiel, M. R. Soloman, & C. F. Surprenant (Eds.), The Service Encounter (pp. 124-47). Lexington, Mass.: Lexington Books.

Bowers, M. R. (1986a). The New Product Development Process: A Suggested Model for Banks. Journal of Retail Banking, 8(1/2), 19-24.

Bowers, M. R. (1986b). The New Service Development Process: Suggestions for Improvement. In J. Czepiel, C. Congram, & J. Shanahan (Eds.), The Services challenge : integrating for competitive advantage (pp. 99-103). Chicago, IL: American Marketing Association.

Bowers, M. R. (1989). Developing New Services: Improving the Process Makes it Better. Journal of Services Marketing, 3(1), 15-20.

Bradbury, N. (1991, August 19-25). How business is failing Canada. Financial Times of Canada, p. 30.

Brooks, H. (1980). Technology, Innovation and Purpose. Daedalus, Winter.

Bryant, A. (1994, January 24). Travelers' Growing Irritation: Many Prices for One Product. New York Times, p. A1.

Burgelman, R. A. (1983). A Model of Internal Corporate Venturing in the Diversified Major Firm. Administrative Science Quarterly, June, 223-44.

Burgelman, R. A., & Sayles, L. R. (1986). Inside Corporate Innovation. New York: The Free Press.

Burns, T., & Stalker, G. M. (1961). The Management of Innovation. London: Tavistock.

Cady, J. F. (1985). Marketing Strategies in the information industry. In R. D. Buzzell (Eds.), Marketing in an electronic age (pp. 249-278). Boston, MA: Harvard Business School Press.

Calantone, R. J., & di Benedetto, C. A. (1990). Successful industrial product innovation : an integrative literature review. New York: Greenwood Press.

Calish, I. G., & Gamache, R. D. (1981). How to overcome organizational resistance to change. Management Review(October), 21-50.

Canada. Department of Communications (1992). Telecommunications in Canada: An overview of the Carriage Industry No. Minister of Supply and Services Canada.

Capell, R. L. (1989) Innovations in telecommunications: can lead users help guide new services development? M.S., Massachusetts Institute of Technology.

Chase, R. B., & Garvin, D. A. (1989). The Service Factory. Harvard Business Review, 89(4), 61-69.

Chase, R. B., & Youndahl, W. (1992). Service by Design. Design Management Journal, 3(1), 9-15.

Clark, C. (1940). The Conditions of Economic Progress. London: MacMillan.

Clark, K., & Fujimoto, T. (1991). Reducing the time to market: the case of the world auto industry. In J. Henry & D. Walker (Eds.), Managing Innovation (pp. 106-116). London: Sage Publications Ltd.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. Administrative Science Quarterly, March, 128-152.

Cooper, R. G. (1983). A process model for industrial new product development. IEEE Transactions in Engineering Management, EM-30(1), 2-11.

Cooper, R. G. (1985). Selecting winning new product projects: Using the NewProd system. The Journal of Product Innovation Management, T 2,(1), 34-44.

Cooper, R. G. (1990). New products: What distinguishes the winners? Research/Technology Management(November-December 1990), 27-31.

Cooper, R. G. (1994). Third Generation New Product Processes. Journal of Product Innovation Management, 11(1), 3-14.

Cooper, R. G., & de Brentani, U. (1991). New Industrial Financial Services: What Distinguishes the Winners. Journal of Product Innovation Management, 8(2), 75.

Cooper, R. G., & Kleinschmidt, E. J. (1986). An Investigation into the New Product Process: Steps, Deficiencies, and Impact. Journal of Product Innovation Management, 3(2), 71-85.

Cooper, R. G., & Kleinschmidt, E. J. (1987). What Makes a New Product a Winner: Success Factors at the Project Level. R&D Management, 17(3), 175-189.

Cooper, R. G., & Kleinschmidt, E. J. (1991). Game Plan for New Products. Ideas for Managers, 3(2), 1-3.

Cowell, D. W. (1984). The Marketing of Services. London: Heinemann.

Crane, D. (1992). The Next Canadian Century: Building a Competitive Economy. Toronto: Stoddart.

Crane, D. (1993, July 21). Corporate giants, not governments, are calling the economic shots, U.N.says. The Toronto Star, p. A19.

Crawford, C. M. (1983). New Products Management. Homewood, IL: Richard D. Irwin.

Crawford, C. M. (1987). New Products Management (2nd ed. ed.). Homewood, IL: Richard D. Irwin.

Curry, I. (1992). Building "Keyhole" People to Increase Organizational Flexibility. In T. M. Khalil & B. A. Bayraktar (Eds.), Third International Conference on Management of Technology (pp. 458-467). Miami, Florida: Industrial Engineering & Management Press.

Cusumano, M. A. (1988). Manufacturing Innovation: Lessons from the Japanese Auto Industry. Sloan Management Review, 30(1), 29-39.

Czepiel, J., Congram, C., & Shanahan, J. (Ed.). (1986). The Services challenge : integrating for competitive advantage. Chicago, IL: American Marketing Association.

David, E. (1984). Trends in R & D. Research and Development, 8, 56-67.

Davis, C. H., & Smith, R. K. (1993). Management of Technology and Technological Change in Canada: Learning and Teaching Innovation and Competitiveness in a Time of Turbulence and Uncertainty. In K. Minden & W. Poh-Kam (Ed.), Conference on Developing Technology Managers: Comparative Pacific Rim Strategies, (pp. 1-55). Singapore: PECC.

de Bono, E. (1992). Sur/Petition: creating value monopolies when everyone else is merely competing. Toronto: HarperCollins Publishers.

de Brentani, U. (1989). Success and Failure in New Industrial Services. The Journal of Product Innovation, 6(4), 239.

Delaunay, J.-C., & Gadrey, J. (1992). Services in Economic Thought: Three Centuries of Debate (Aart Heesterman, Trans.). Boston: Kluwer Academic Publishers.

Demers, M. (1992). Responding to the Challenges of the Global Economy: The Competitiveness Agenda. In F. Abele (Eds.), How Ottawa Spends:

1992-93: The Politics of Competitiveness Ottawa: Carleton University Press.

Deming, W. E. (1985). Transformation of Western Style of Management. Interfaces, 15(3), 6-11.

Dertouzos, M., Lester, R., & Solow, R. (1989). Made in America: Regaining the Productive Edge. Cambridge, Mass: The MIT Press.

Doern, G. B., & Purchase, B. B. (Ed.). (1991). Canada at Risk? : Canadian Public Policy in the 1990s. Ottawa: C.D. Howe Institute.

Donnellon, A. (1993). Crossfunctional Teams in Product Development: Accomodating the Structure to the Process. Journal of Product Innovation Management, 10, 377-392.

Donnelly, J. H., & George, W. R. (Ed.). (1981). Marketing of Services. Chicago, IL: American Marketing Association.

Dosi, G. (1982). Technological Paradigms and Technological Trajectories. Research Policy, 11, 147-162.

Drucker, P. (1985). The discipline of innovation. Harvard Business Review, May-June, 67-72.

Drucker, P. F. (1974). Management. New York: Harper & Row.

Drucker, P. F. (1992). Managing for the Future: the 1990s and beyond. New York, N.Y.: Truman Talley Books.

Dumaine, B. (1993, December 13). Payoff from the new management. Fortune, p. 103-110.

Duncker, K. (1945). On Problem Solving. Psychological Monographs, 58(5).

Easingwood, C. J. (1986). New product development for service companies. Journal of Product Innovation Management, 4, 264-275.

Easingwood, C. J. (1988). Product lifecycle patterns for new industrial products. R&D Management, 18(1), 23-33.

Economic Council of Canada (1990). Good jobs, bad jobs : employment in the service economy : a statement. Ottawa: Economic Council of Canada.

Eiglier, P., & Langeard, E. (1987). Servuction. Paris: McGraw-Hill.

Eisenhardt, K. M. (1989). Building theories from case study research. (Special Forum on Theory Building). Academy of Management Review, 14(4), 532-550.

Engel, C. (1857). Die produtions und sonsumptionsverhaltnisse des Konigreiches Sachens. Zeitschrift des statistichen Bureaus des koniglich-sachisischen Ministerium des Innern.

Engst, A. (1993). The Internet Starter Kit for Macintosh. Indianapolis, IN: Hayden Books.

Enis, B. M., & Roering, K. J. (1981). Services Marketing: Different Products, Similar Strategy. In J. H. Donnelly & W. R. George (Ed.), AMA's Special Conference on Services Marketing, Marketing of Services (pp. 1-4). Orlando, FL: American Marketing Association, Chicago, IL.

Fabrycky, W. J., & Blanchard, B. S. (1991). Life-Cycle Cost and Economic Analysis. Englewood Cliffs, N.J.: Prentice-Hall, Inc.

Fisher, A. G. B. (1935). The Clash of Progress and Security. London: MacMillan.

Fisk, R. P., Tansuhaj, P. S., & Hromas, J. G. (1985). Assessing the Services Marketing Literature. In T. M. Bloch, G. D. Upah, & V. A. Zeithaml (Eds.), Services marketing in a changing environment (pp. 173-175). Chicago, IL: American Marketing Association.

Foster, R. N. (1986). Timing Technological Transitions. In M. Horwitch (Eds.), Technology in the Modern Corporation (pp. 35-49). New York: Pergamon.

Freeman, C. (1974). The Economics of Industrial Innovation. London: Penguin.

Fuchs, V. (1968). The Service Economy. New York: National Bureau of Economic Research.

Funtowicz, S. O., & Ravet, J. R. (1989). Managing uncertainty in policy-related research. In International Colloquium, Les Experts sont Formels: Controverses Scientifique et Décisions Politique dans le Domaine de L'Environnment

Garvin, D. A. (1993). Building a Learning Corporation. Harvard Business Review, 71(4), 78-91.

Geertz, C. (1973). The Interpretation of Cultures. New York: BasicBooks.

George, W. R., & Marshall, C. E. (Ed.). (1984). Developing new services. Chicago, Ill.: American Marketing Association.

George, W. R., Weinburger, M. G., & Kelly, J. P. (1985). Consumer Risk Perceptions: Managerial Tools for the Service Encounter. In J. e. a. Czepiel (Eds.), The Service Encounter (pp. 83-99). Lexington, Mass.: Lexington Books.

Gershuny, J. I. (1978). After industrial society? : The emerging self-service economy. London: Macmillan.

Gershuny, J. I. (1982). Social innovation: change in the mode of provision of services. Futures, 14(December), 496-516.

Gershuny, J. I., & Miles, I. D. (1983). The new service economy : the transformation of employment in industrial societies. London: F. Pinter.

Gerson, E. M. (1993). Grounded theory (cont.). In electronic-mail to "Sci-tech-studies" mailing list.

Giarini, O. (1992, June). The Service Economy: Three Basic Issues. Progres Newsletter, p. 4-6.

Gilder, G. (1991). Into the Telecosm. Harvard Business Review, 69(2), 150-161.

Gilder, G. (1993a). Telecosm - "The new rule of wireless". Forbes, Suppleme(t), 96-111.

Gilder, G. (1993b). Telecosm: "Metcalfe's law and legacy". Forbes, Suppleme(t), 158-166.

Gilder, G. (1993c). Telecosm: "The Issaquah Miracle". Forbes, Suppleme(t), 114-123.

Glaser, B. G., & Strauss, A. L. (1967). The Discovery of Grounded Theory: Strategies for Qualitative Research. Chicago: Aldine.

Globerman, S. (1994). Comments on innovation and competition. In Correspondence.

Gordon, A. S., & Fisk, R. P. (1987). Electronic Service Delivery: Design Issues. In C. Surprenant (Eds.), Add value to your service : the key to success (pp. 137-141). Chicago, Ill.: American Marketing Association.

Granovetter, M. S. (1974). Getting a Job. Cambridge, MA: Harvard University Press.

Griffin, A., & Page, A. L. (1993). An Interim Report on Measuring Product Development Success and Failure. Journal of Product Innovation Management, 10, 291-308.

Grönroos, C. (1990). Service Management and Marketing. Lexington, MA: Lexington Books.

Grubel, H. G., & Walker, M. A. (1989). Modern Service Sector Growth: Causes and Effects. In H. Giersch (Eds.), Services in world economic growth : symposium, 1988 (pp. 1-34). Tübingen: J.C.B. Mohr (P. Siebeck).

Guile, B. R., & Quinn, J. B. (Ed.). (1988a). Managing Innovation: Cases from the Services Industries. Washington, D.C.: National Academy Press.

Guile, B. R., & Quinn, J. B. (1988b). Technology in Services: Policies for Growth, Trade, and Employment. Washington, D.C.: National Academy Press.

Gummesson, E. (1989). Nine Lessons on Service Quality. Total Quality Management (February).

Gupta, A. K., & Wilemon, D. (1990). Accelerating the development of technology-based new products. California Management Review, 32(2), 24-44.

Guseman, D. S. (1981). Risk Perception and Risk Reduction in Consumer Services. In J. H. Donnelly & W. R. George (Ed.), AMA's Special Conference on Services Marketing, Marketing of Services (pp. 200-204). Orlando, FL: American Marketing Association.

Hackman, J. R., & Walton, R. (1986). Leading groups in organizations. In P. Goodman (Eds.), Designing effective workgroups (pp. 72-119). San Francisco: Jossey-Bass.

Hall, P. (Ed.). (1986). Technology, Innovation and Economic Policy. Oxford: Philip Allan.

Halliday, A. L. (1993). Product Change: The Perils of Moving Too Fast. Harvard Business Review, 71(4), 10.

Hamel, G., & Prahalad, C. K. (1989). Strategic Intent. Harvard Business Review (May-June), 63-76.

Hammer, M., & Champy, J. (1993). Re-engineering the corporation: a manifesto for business revolution. New York: Harper Business.

Hampden-Turner, C., & Trompenaars, A. (1993). The seven cultures of capitalism: value systems for creating wealth in the United States, Japan, Germany, France, Britain, Sweden, and the Netherlands. New York: Doubleday.

Harvey, J., Lefebvre, E., & Lefebvre, L. A. (1992a). Technology and the Creation of Value in Services: A Conceptual Model. In P. T. Harker (Ed.), 1992 Wharton Conference on Service Management, Economics and Technology: The Service Productivity and Quality Challenge, . Philadeliphia, PA: Fishman-Davison Center for the Study of the Service Sector.

Harvey, J., Lefebvre, L. A., & Lefebvre, E. (1992b). Technological Change and the Customer Contact Paradigm in Services. In T. M. Khalil & B. A. Bayraktar (Eds.), Management of Technology III (pp. 898-906). Norcross, GA: Institute of Industrial Engineers.

Haynes, R. M., & Thies, E. A. (1992). Management of Technology in Service Firms. Journal of Operations Management, 10(3), 388-397.

Henderson, R. M., & Clark, K. B. (1990). Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. Administrative Science Quarterly, 35, 9-30.

Henke, J. W., Krachenberg, A. R., & Lyons, T. F. (1993). Cross-Functional Teams: Good Concept, Poor Implementation! Journal of Product Innovation Management, 10, 216-229.

Heskett, J. L. (1986). Managing in the Service Economy. Boston, MA: Harvard Business School Press.

Imai, K.-i., Nonaka, I., & Takeuchi, H. (1985). Managing New Product Development Process: How Japanese Companies Learn and Unlearn. In R. H. H. Kim B. Clark Christopher Lorenz (Eds.), The Uneasy Alliance, Managing the Productivity-Technology Dilema (pp. 337-375). Cambridge, Ma: Harvard Business School Press.

Innis, H. A. (1964, c1951). The bias of communication (introd. by Marshall McLuhan ed.). Toronto: University of Toronto Press.

Innis, H. A. (1972). Empire and communications (Rev ed.). Toronto: University of Toronto Press.

Johne, F. A. (1984). How experienced new product innovators organize. Journal of Product Innovation Management, 1(December), 210-223.

Johne, F. A., & Snelson, P. A. (1988). Success Factors in Product Innovation. A selected review of the literature. Journal of Product Innovation Management, 5(2), 114-128.

Kanter, R. M. (1982). The Middle Manager as Innovator. Harvard Business Review(July/August), 95-105.

Kanter, R. M. (1983). The Change Masters: Innovations for Productivity in the American Corporation. New York: Simon & Schuster.

Kanter, R. M. (1988). When a Thousand Flowers Bloom: Structural, Collective, and Social Conditions for Innovation in Organization. In B. Straw & L. L. Cummings (Eds.), Research in Organizational Behavior (pp. 169-211). Greenwich, CT: JAI Press.

Kanter, R. M. (1989). When giants learn to dance: Mastering the challenges of strategy, management and careers in the 1990's. New York, NY: Simon and Schuster.

Karagozoglu, N., & Brown, W. B. (1993). Time-Based Management of the New Product Development Process. Journal of Product Innovation Management, 10, 204-215.

Katz, R. (1982). The Effects of Group Longevity on Project Communication and Performance. Administrative Science Quarterly, 27, 81-104.

Katz, R., & Tushman, M. (1979). Communication Patterns, Project Performance, and Task Characteristics: An Empirical Evaluation and Integration in an R&D Setting. Organizational Behavior and Human Performance, 23, 139-162.

Katzenbach, J. R., & Smith, D. K. (1993a). The Discipline of Teams. Harvard Business Review, 71(2), 111-120.

Katzenbach, J. R., & Smith, D. K. (1993b). The Wisdom of Teams: Creating the High-Performance Organization. Boston, MA: Harvard Business School Press.

Kazanjian, R. K., & Drazin, R. (1986). Implementing manufacturing innovations: Critical choices of structure and staffing roles. Human Resources Management, 25, 385-403.

Keen, P. G. W. (1988). Competing in Time: Using Telecommunications for Competitive Advantage (Second ed.). Cambridge, MA: Ballinger Publishing Company.

Keller, R. T. (1986). Predictors of the Performance of Project Groups in R&D Organizations. Academy of Management Journal, 29, 715-726.

Keller, R. T., & Holland, W. E. (1983). Communicators and Innovators in Research and Development Organizations. Academy of Management Journal, 26, 742-749.

Kolbe, K. (1993). Pure instinct : business' untapped resource. New York: Times Books, Random House.

Kopp, R. J., & Jadhav, A. (1986). A Case Study of GTE Telemessager. In J. Czepiel, C. Congram, & J. Shanahan (Eds.), The Services challenge : integrating for competitive advantage (pp. 99-103). Chicago, IL: American Marketing Association.

Kraemer, J. S. (1992). The effects of competition on dominant carriers: common patterns of worldwide change No.

Krugman, P. (1994). Competitiveness: Does it Matter. Fortune, 129(5), 109-115.

Kuczmarski, T. D. (1992). Managing New Products: The Power of Innovation. Englewood Cliffs, NJ: Prentice-Hall.

Kuczmarski, T. D. (1993). Screening Potential New Products. Planning Review(July/August), 24-48.

Langeard, E., & Eiglier, P. (1983). Strategic Management of Service Development. In L. T. Berry, G. L. Shostak, & G. D. Upah (Eds.), Emerging perspectives on services marketing (pp. 68-72). Chicago, IL: American Marketing Association.

Langeard, E., Reggait, P., & Eiglier, P. (1986). Developing New Services. In M. Venkatesan, D. M. Schmalennee, & C. Marshall (Eds.), Creativity in Services Marketing: What's New, What Works, What's Developing? Chicago, IL: American Marketing Association.

Lave, J. (1988). Cognition in Practice: Mind, Mathematics, and Culture in Everyday Life. New York: Cambridge University Press.

Layton, E. (1977). Conditions of Technological Development. In I. Spiegel-Rosing & D. de Solla Price (Eds.), Science, Technology and Society Sage: Beverly Hills, California.

Lee, A. S. (1989). Case Studies as Natural Experiments. Human Relations, 42(2), 117-137.

Leiss, W. (1990). Under Technology's Thumb. Montreal and Kingston: McGill-Queen's University Press.

Leiss, W. (1994). Risk Communication and Public Knowledge. In D. Crowley & D. Mitchell (Eds.), Communication Theory Today Cambridge: Polity Press.

Lesh, A. D., & Gilly, M. C. (1985). Using Consumers to Guide the Way to Design New Services. In T. M. Bloch, G. D. Upah, & V. A. Zeithaml (Eds.), Services marketing in a changing environment (pp. 118-123). Chicago, IL: American Marketing Association.

Levitt, T. (1976). Industrialization of Service. Harvard Business Review, 54(5), 63-74.

Linden, L. H. (1992). The business of technology. Issues in Science and Technology, 8(4), 60-68.

Lindstrom, A. (1993, May 3). ISDN Proponents Push for Widespread Deployment of Products & Services. Communications Week, p. 42.

Lipsey, R. G. (1991). Economic Growth: Science and Technology and Institutional Change in a Global Economy (Publication Series No. 4). Canadian Institute for Advanced Research: Program in Economic Growth and Policy, Vancouver BC.

Lipsey, R. G. (1993). Globalization, Technological Change and Economic Growth (Lecture No. Annual Sir Charles Carter Lecture). Canadian Institute for Advanced Research.

Lovelock, C. H. (1980). Towards a Classification of Services. In C. W. Lamb & P. M. Dunne (Eds.), Theoretical Developments in Marketing Chicago, Ill.: American Marketing Association.

Lovelock, C. H. (1981). Why Marketing Management Needs to Be Different for Services. In J. H. Donnelly & W. R. George (Ed.), AMA's Special Conference on Services Marketing, Marketing of Services (pp. 5-9). Orlando, FL: American Marketing Association.

Lovelock, C. H. (1983). Classifying Services to Gain Strategic Marketing Insights. Journal of Marketing, 47(3), 9-20.

Lovelock, C. H. (1984a). Developing and Implementing New Services. In W. R. George & C. E. Marshall (Eds.), Developing new services Chicago, Ill.: American Marketing Association.

Lovelock, C. H. (1984b). Service Marketing. Engelwood Cliffs, NJ: Prentice-Hall.

Luchins, A. S. (1942). Mechanization in Problem-Solving: The Effect of *Einstellung*. Psychological Monographs, 54.

Lundstedt, S. B., & E. William Colglazier, J. (Ed.). (1982). Managing Innovation: The social dimensions of creativity, invention and technology. New York, NY: Pergamon Press.

Maidique, M. A., & Zirger, B. J. (1984). A Study of Success and Failure in Product Innovation: The Case of the US Electronics Industry. IEEE Transations on Engineering Management, 31(November), 192-203.

Mansell, R. (1990). Rethinking the Telecommunication Infrastructure: The New "Black Box". Research Policy, 19, 501-515.

Mansfield, E. (1968). The Economics of Technological Change. New York: Norton.

Marshall, R. R. (1991). Management of Technology in Canada. In ASEE/CIEC Conference, . San Diego: January 30.

Martin Jr., C. R., & Horne, D. A. (1993). Services innovation: Successful versus unsuccessful firms. International Journal of Service Industry Management, 4(1), 49-65.

McCracken, E. (1993). Mastering Chaos at the High-Tech Frontier: An Interview with Silicon Graphics's Ed McCracken. Harvard Business Review(Nov-Dec), 138-139.

McLaughlin, J. F., & Birinyi, A. E. (1980). Mapping the Information Business No. Program on Information Resources Policy, Harvard University.

McLuhan, M. (1962). The Gutenberg galaxy : the making of typographic man. Toronto: University of Toronto Press.

McLuhan, M. (1964). Understanding media : the extensions of man. New York: McGraw-Hill.

Miles, M. B., & Huberman, A. M. (1984). Analyzing Qualitative Data: A source book for new methods. Newbury Park, CA: Sage Publications.

Mintzberg, H. (1994). The fall and rise of strategic planning. Harvard Business Review, 72(1), 107-114.

Mitchell, G. R. (1989). Research and development for services. Research Technology Management, 32(6), 37-44.

Mitchell, G. R. (1990). R&D Strategy for the Services Sector. In T. M. Khalil & B. A. Bayraktar (Eds.), Management of Technology II: The Key to Global Competitiveness, Second International Conference on Management of Technology (pp. 951-962). Norcross, Ga.: Industrial Engineering and Management Press.

Mitchell, J. C. (1983). Case and situation analysis. The Sociological Review, 31(May), 187-211.

Monge, P. R., Cozzens, M. D., & Contractor, N. S. (1992). Communication and Motivational Predictors of the Dynamics of Organizational Innovation. Organization Science, 3(2), 250-274.

Morita, A. (1991, June 21). Don't just stand there, manufacture something. Financial Post Daily, p. 7.

Morone, J. (1993). Winning in High-Tech Markets: The Role of General Management. Boston, MA: Harvard Business School Press.

Morone, J., Berg, D., & Pitt, I. (1990). Technology and the Service Sector: A Conceptual Approach. In T. M. Khalil & B. A. Bayraktar (Eds.), Management of Technology II: The Key to Global Competitiveness, Second International Conference on Management of Technology (pp. 937-949). Norcross, Ga.: Industrial Engineering and Management Press.

Myers, S., & Marquis, D. (1969). Successful Industrial Innovations: A Study of the Factors Underlying the Innovations in Selected Firms. Washington, D.C.: The National Science Foundation.

NABST (1992). Measuring up to the Benchmark and Moving Ahead. Report of the NABST Committee on Technology Acquisition and Diffusion. Ottawa: National Advisory Board on Science and Technology.

Naylor, R. T. (1972). The rise and fall of the third commercial empire of the St. Lawrence. In G. Teeple (Eds.), Capitalism and the National Question in Canada (pp. 1-41). Toronto: University of Toronto Press.

Normann, R., & Ramirez, R. (1993). From Value Chain to Value Constellation: Designing Interactive Strategy. Harvard Business Review, 71(4), 65-77.

Noyelle, T. (1990). Overview. In T. Noyelle (Eds.), Skills, Wages, and Productivity in the Service Sector (pp. 1-10). Boulder: Westview Press.

O'Riordan, T., & Rayner, S. (1991). Risk Management global environmental change. Global Environmental Change(March), 91-118.

Oakley, B. T. (1993). Total quality product design - How to integrate environmental criteria into the production realization process. Total Quality Environmental Management, 2(3), 309-321.

Olson, M. (1982). The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities. New Haven: Yale University Press.

Osborn, A. F. (1963). Applied Imagination: principles and procedures of creative thinking (Rev. Ed. ed.). New York: Scribner.

Ostry, B. (1994). The Electronic Connection: An Essential Key to Canadians' Survival Industry Science Canada.

Page, A. L. (1993). Assessing New Product Development Practices and Performance: Establishing Crucial Norms. Journal of Product Innovation Management, 10, 273-290.

Paré, T. P. (1993). How to find out what they want. Fortune, 128(13), 39-41.

Pavitt, K. (1984). Sectoral Patterns of Technical Change: Towards a Taxonomy and a Theory. Research Policy, 13(6), 343-373.

Peters, T. (1987). Thriving on Chaos. New York, NY: Alfred A. Knopf.

Peters, T. J., & Waterman, R. H. (1982). In Search of Excellence. New York: Harper & Row.

Porter, M. E. (1979). How Competitive Forces Shape Strategy. Harvard Business Review, March-April, 137-145.

Porter, M. E. (1980). Competitive Strategy. New York, NY: The Free Press.

Porter, M. E. (1985). Competitive advantage : creating and sustaining superior performance. New York: Free Press.

Porter, M. E. (1990). The competitive advantage of nations. New York: Free Press.

Porter, M. E. (1991). Canada at the Crossroads: The Reality of a New Competitive Environment. Ottawa: Business Council on National Issues, Minister of Supply and Services Canada.

Powers, T. L. (1986). Marketing for Telecommunications: Emphasizing Long-Term Strategy. In J. Czepiel, C. Congram, & J. Shanahan (Eds.), The Services challenge : integrating for competitive advantage (pp. 73-77). Chicago, IL: American Marketing Association.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. Harvard Business Review(May-June), 79-91.

Purchase, B. B. (1991). The Innovative society : competitiveness in the 1990s (Policy review and outlook No. C.D. Howe Institute.

Quinn, J. B. (1985). Managing Innovation: Controlled Chaos. Harvard Business Review, 53(May-June), 73-84.

Quinn, J. B. (1988). Technology in services: Past myths and future challenges. In B. R. Guile & J. B. Quinn (Eds.), Technologies in Services: Policies for growth, trade and employment Washington, D.C: National Academy Press.

Quinn, J. B. (1992). Intelligent enterprise: a knowledge and service based paradigm for industry. New York: The Free Press.

Quinn, J. B., Doorley, T. L., & Paquette, P. C. (1990). Beyond products: services-based strategy. Harvard Business Review, 68(2), 58(7).

Quinn, J. B., & Mueller, J. A. (1963). Transfering research results to operations. Harvard Business Review, 41, 44-87.

Quinn, J. B., & Paquette, P. C. (1990). Technology in services: creating organizational revolutions. Sloan Management Review, 31(2), 67-78.

Rathmell, J. M. (1974). Marketing in the Services Sector. Cambridge, Mass.: Winthrop Publishers Inc.

Reddy, Y. V. R., Srinivas, K., Jagannathan, V., & Karinthi, R. (1993). Computer Support for Concurrent Engineering. Computer, 26(1), 12-15.

Regan, W. J. (1963). The Service Revolution. Journal of Marketing, 47(July), 57-62.

Reich, R. B. (1991). The work of nations: preparing ourselves for 21st century capitalism. New York: A.A. Knopf.

Rethans, A. J., Roberts, A. D., & Leigh, T. W. (1985). Towards a Research Cycle for New Services Development. In T. M. Bloch, G. D. Upah, & V. A. Zeithaml (Eds.), Services marketing in a changing environment (pp. 124-127). Chicago, IL: American Marketing Association.

Robinson, R. K. (1983). New Service Development: The Cable TV Connection. In L. T. Berry, G. L. Shostak, & G. D. Upah (Eds.), Emerging perspectives on services marketing (pp. 73-76). Chicago, IL: American Marketing Association.

Rogers, E. M. (1962). Diffusion of Innovations. New York, N.Y.: The Free Press.

Rogers, E. M. (1983). The Diffusion of Innovations (3rd ed.). New York, N.Y.: The Free Press.

Rogers, E. M., & Shoemaker, F. F. (1971). Communication of Innovation: A Cross-Cultural Approach (2nd ed. ed.). New York: Free Press.

Rosenau, M. D., Jr. (1988). Faster new product development. Journal of Product Innovation Management, 5, 150-153.

Rosenau, M. D., Jr. (1990). Faster new product development. New York, NY: AMACOM.

Rosenberg, N. (1991). Economic Experiments (Working Paper No. 1). Canadian Institute for Advanced Research: Program in Economic Growth and Policy, Vancouver BC.

Rosenberg, N., & Birdzall Jr., L. E. (1986). How the West Grew Rich: the economic transformation of the industrial world. New York: Basic Books.

Rothwell, R. (1977). The characteristics of successful innovators and technically progressive firms (with some comments on innovation research). R & D Management, 7(3), 191-206.

Royal Commission on the Economic Union and Development Prospects for Canada (1985). Report of the Royal Commission on the Economic Union and Development Prospects for Canada. Ottawa: Minister of Supply and Services Canada.

Rubenstein, A. H. (1989). Managing Technology in the Decentralized Firm. New York: John Wiley & Sons.

Rushton, A. M., & Carson, D. J. (1986). The marketing of services: managing the intangibles. European Journal of Marketing, 19, 19-40.

Salter, L., & Wolfe, D. (Ed.). (1990). Managing technology: social science perspectives. Toronto: Garamond Press.

Schneider, B. (1984). New Service Design, Development and Implementation and the Employee. In W. R. George & C. E. Marshall (Eds.), Developing new services (pp. 85-89). Chicago, Ill.: American Marketing Association.

Schoonhoven, C. B., Eisenhardt, K. M., & Lyman., K. (1990). Speeding products to market: waiting time to first product introduction in new firms. Administrative Science Quarterly, 35(1), 177-207.

Science Council of Canada (1988). Gearing Up for Global Markets: from Industry Challenge to Industry Commitment. Ottawa: Science Council of Canada.

Science Council of Canada (1992a). The Canadian Telecommunications Sector (Sectoral Technology Strategy Series No. 1). Minister of Supply and Services.

Science Council of Canada (1992b). Reaching for Tomorrow: Science and Technology Policy in Canada 1991. Ottawa: Minister of Supply and Services.

Science Policy Research Unit (1991). Annual Report 1990-1991 (Annual No. University of Sussex.

Seely Brown, J., & Duguid, P. (1991). Organizational learning and communities-of-practice: toward a unified view of working, learning, and innovation. Organization Science, 2(1), 40-57.

Shenhar, A. J. (1992). A Two Dimensional Construct Model for the Classification of Technical Projects. In T. M. Khalil & B. A. Bayraktar (Eds.), Third International Conference on Management of Technology (pp. 1491). Norcross, Ga.: Industrial Engineering and Management Press.

Sheth, J. N., & Ram, S. (1987). Bringing innovation to market: How to break corporate and customer barriers. New York, NY: Wiley and Sons.

Shostack, G. L. (1977). Breaking free from Product Marketing. Journal of Marketing(April), 73-80.

Shostack, G. L. (1981). How to design a service. In J. H. Donnelly & W. R. George (Eds.), Marketing of Services (pp. 221-229). Chicago, IL: American Marketing Association.

Shostack, G. L. (1984). Designing Services that Deliver. Harvard Business Review, 62(Jan-Feb), 133-139.

Smith, P. G., & Reinertsen, D. G. (1991). Developing products in half the time. New York: Van Nostrand Reinhold.

Sokol, M. B. (1992). Service Initiatives for the Adoption of New Technology. In K. T. M. & B. A. Bayraktar (Eds.), Management of Technology III (pp. 907-917). Norcross, GA: Institute of Industrial Engineers.

Stahl, S. (1994, March 14). Open House at Bell Atlantic? Information Week, p. 15.

Stalk, G. (1988). Time—The Next Source of Competitive Advantage. Harvard Business Review(July-Aug.), 41-51.

Stalk, G., Evans, P., & Shulman, L. E. (1992). Competing on capabilities: The new rules of corporate strategy. Harvard Business Review(March-April 1992), 57-69.

Stalk, G., Jr., & Hout, T. M. (1990a). Competing Against Time. Research-Technology Management, March-April, 19-24.

Stalk, G., Jr. , & Hout, T. M. (1990b). Competing against time : how timebased competition is reshaping global markets. New York: Free Press.

Stalk, G., Jr. , & Webber, A. M. (1993). Japan's Dark Side of Time. Harvard Business Review, July-August, 93-.

Stalk, J. G. (1993, May 20). How speed demons can win on innovation. The Globe and Mail, p. B20.

Stoecker, R. (1991). Evaluating and rethinking the case study. The Sociological Review, 39(1), 88-112.

Strauss, A., & Corbin, J. (1990). Basics of Qualitative Research: Grounded Theory Procedures and Techniques. Newbury Park, California: Sage.

Strauss, A. L. (1990). Qualitative Analysis for Social Scientists. Cambridge: Cambridge University Press.

Surprenant, C. (Ed.). (1987). Add value to your service : the key to success. Chicago, Ill.: American Marketing Association.

Takeuchi, H., & Nonaka, I. (1986). The New New Product Development Game. Harvard Business Review, 64(January-February), 137-146.

Teare, R., Moutinho, L., & Morgan, N. (Ed.). (1990). Managing and marketing services in the 1990s. London, England: Cassell Educational Ltd.

Thamhain, H. J. (1990). Managing technologically innovative team efforts toward new product success. Journal of Product Innovation Management, 7, 5-18.

Thomas, D. (1978). Strategy is Different in Service Businesses. Harvard Business Review(July-August), 159-165.

Thurow, L. C. (1992). Head to Head: The coming economic battle among Japan, Europe, and America. New York: William Morrow and Company.

Timmons, J. A. (1990). New Venture Creation: entrepreneurship in the 1990s (3rd ed.). Boston, MA: Irwin.

Tushman, M. L. (1977). Social boundary roles in the innovation process. Administrative Science Quarterly, 22, 587-605.

Udwadia, F. E., & Kumar, K. R. (1991). Impact of Customer Coconstruction in Product/Service Markets. Technological Forecasting and Social Change, 40, 261-272.

Urban, G. L., & von Hippel, E. (1988). Lead user analyses for the development of new industrial products. Management Science, 34(5), 569-582.

Uttal, B. (1988). Speeding New Ideas to Market. Fortune, 115(2 March), 62-66.

Van de Ven, A. H. (1985). Central problems in the management of innovation. Cambridge, Mass.: Marketing Science Institute.

Van de Ven, A. H. (1986). Central problems in the management of innovation. Management Science, 32(May), 590-607.

Venkatesan, M., Schmalensee, D. M., & Marshall, C. (Ed.). (1986). Creativity in services marketing : what's new, what works, what's developing. Chicago, IL: American Marketing Association.

von Hippel, E. (1985). Learning from Lead Users. In R. D. Buzzell (Eds.), Marketing in an Electronic Age (pp. 308-317). Cambridge, MA: Harvard Business School Press.

von Hippel, E. (1986). Lead Users: A source of novel product concepts. Management Science, 32(July), 791-805.

von Hippel, E. (1988). The sources of Innovation. New York: Oxford University Press.

Von Oech, R. (1990). A whack on the side of the head : how you can be more creative (Rev. ed.). New York: Warner Books.

Weiss, A. R., & Birnbaum, P. H. (1989). Technological infrastructure and the implementation of technological strategies. Management Science, 35(8), 1014-1026.

Whyte, W. F. (1943). Street Corner Society. Chicago: University of Chicago Press.

Whyte, W. F. (1982). Social Inventions for Solving Human Problems. American Sociological Review, 47(1), 1-13.

Whyte, W. F. (1989). Advancing Scientific Knowledge through Participatory Action Research. Sociological Forum, 4(3), 367-385.

Whyte, W. F. (Ed.). (1991). Participatory Action Research. Newbury Park, CA: Sage.

Whyte, W. F., & Alberti, G. (1976). Power, Politics and Progress: Social Change in Rural Peru. New York: Elsevier.

Whyte, W. F., Greenwood, D. J., & Lazes, P. (1989). Participatory Action Research: Through Practice to Science in Social Research. American behavioral scientist., 32(5), 513.

Whyte, W. F., Hamilton, E. L., & Wiley., M. C. (1964). Action research for management : a case report on research and action in industry. Homewood, Ill.: R. D. Irwin.

Wind, Y. (1982). Product Policy: Concepts, Methods and Strategy. Reading, MA: Addison-Wesley.

Wood, P. (1988). The Economic Role of Producer Services: Some Canadian Evidence. In J. N. Marshall (Eds.), Services and Uneven Development (pp. 268-278). Oxford: Oxford University Press.

Woodrow, R. B. (1989). Telecommunications Services in Canada: The Changing Policy and Regulatory Context. In W. R. Frisbee & M. S. Sommers (Eds.), Services in Canada (pp. 106-127). London: F. Cass.

Woodrow, R. B., & Woodside, K. B. (1987). Policy Instruments and Industrial Policy in Canada: The Case of the Telecommunications and Informatics Sector in Canada. paper presented to the Annual Meeting of the Canadian Political Science Association, Hamilton, ON, June 1987.

Wright, L. K. (1990) Characterizing successful new business services. Ph.D., The Pennsylvania State University.

Yin, R. K. (1989). Case Study Research: Design and Methods (2nd ed.). Newbury Park, Calif.: Sage Publications.

Zaltman, G., Duncan, R., & Holbek, J. (1973). Innovations and Organization. New York: Wiley.

Zeithaml, V. A. (1981). How Consumer Evaluation Processes Differ Between Goods and Services. In J. H. Donnelly & W. R. George (Eds.), Marketing of Services Chicago, IL: American Marketing Association.

Zeithaml, V. A. (1988). Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence. Journal of Marketing, 52(July), 2-22.