

Does Early Success and Market Dominance Help or Hinder Future Innovative Capability?

by

Sinead E. O'Flanagan

Bachelor of Science (Physics), National University of Ireland, Galway, 1985

Submitted to the MIT Sloan School of Management in partial fulfillment of the requirements for the degree of

Master of Science in Management of Technology

at the

Massachusetts Institute of Technology

June 2007

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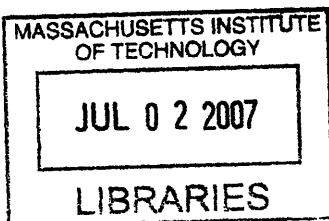
MIT Sloan School of Management
May 16, 2007

Certified By: _____

Michael A. Cusumano
Sloan Management Review Distinguished Professor of Management
Thesis Advisor

Accepted By: _____

Stephen J. Sacca
Director, MIT Sloan Fellows Program in Innovation and Global Leadership



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ABSTRACT

Many successful innovative companies are acquired and become absorbed into larger more structured organizations. The innovation capabilities of the company change in the new environment depending on the extent to which they are nurtured or overridden. This thesis looks at one particular story of such an acquisition and follows its progress after it has been formally integrated into the acquiring company. More than five years after the acquisition the company's innovation is struggling, perhaps even more so in recent years. This thesis looks at the underlying causes of that struggle, the inflexibility of the larger more structured organization and the resistance of the acquired company, due to its earlier success, to adapt itself to the rigours of a larger company,. The thesis strives to answer the question: "Does early success and market dominance help or hinder future innovative capability?"

The author worked with the acquired company, as a management consultant, for a four year period beginning shortly after the company was acquired. The culture then, was strikingly positive and very enjoyable to work in. It had an almost magnetic draw. During the years that followed that culture began to be eroded and the atmosphere changed palpably as people struggled with the manner in which new systems and structures were being established. There was constantly a sense of being imposed on by the parent company rather than being support. That eventually took its toll on people and in recent years some key employees have left. Having stepped back from the organization, the author continues to reflect on what could have been done differently along with what can be done today to retain and restore some of that strong company creativity and innovativeness.

The author's underlying purpose for doing this thesis, in addition to answering the research questions, is to reaffirm the belief that profitable, successful businesses and strongly held values can and should coexist.

Thesis Advisor: Michael A. Cusumano
Sloan Management Review Distinguished Professor of Management Thesis Advisor

ACKNOWLEDGEMENTS

It is with great pleasure that I thank all those who have helped me during my time at MIT and specifically in the development of this thesis.

I wish to acknowledge Professor Michael Cusumano, my Faculty Advisor, for his guidance, insight, and patience in allowing this thesis to evolve. This allowed me to integrate all my key learning experiences from the MIT Sloan School, the Harvard Business School and the Harvard University, Kennedy School of Government. I will continue to appreciate his honest reflections. I am very grateful to Professor Clayton Christensen from the Harvard Business School for sharing his wisdom in discussing this thesis, and for providing practical suggestions for analysis. A sincere thank you is due to Professor Rebecca Henderson, for her truly inspiring course and also for her encouraging responses to my class questions. I wish to thank Professor Diane Burton for her flexibility and enthusiasm, when it came to integrating my thesis work with her course work, making both more valuable. I am most grateful to Professor John Van Maanen for both his motivating and general thesis tips; to Professor Edward Schein for sharing his wisdom with the Sloan Fellows. It is difficult to describe the transformative experience of studying with Professor Ronald Heifetz at the Harvard University, Kennedy School of Government. It was the perfect compliment to my immersion in business and technology at MIT.

A heartfelt thank you is due to Professor Richard Locke for his constant encouragement in developing my seedling ideas on sustainability in business. I wish to acknowledge a number of my Sloan Fellow colleagues and other Sloan students who tirelessly shared the spring work load, allowing us to successfully complete an inspiring 'Sustainability at Sloan' Spring Speaker Series. I don't know how we got it all done, but it was true teamwork. I am grateful to my stellar teammates Dairiku (Dai) Hozumi, Kara Penn, Kate Parrot, Pascal Marmier, Pragnya Yogesh Alekal, Chandrika Samarth, Tana Utley, Thierry Senechal and Zairo Cheibub for a great semester. I am indebted to Peter Senge for his openness in deliberating many ideas with our team throughout the year. To Stephen Sacca and the enthusiastically committed staff of the Sloan Fellows Program office, thanks for sharing the fun. A special thanks is due to visiting fellow John Sangolt, for providing his wholehearted support in completing this thesis and for sharing his many insights into the oil and gas industry along the way.

I am truly delighted to have had the opportunity to complete my thesis project with my former work colleagues at IHS Energy Canada. I wish to acknowledge Chris Jones, in particular, for his trust, commitment and his sharing of ideas in allowing this research idea to evolve. I was very happy to reconnect with so many past and present IHS employees during this time. I want to express deep thanks to all those who took time to answer my endless questions, namely Chris Jones, Ganesh Murdeshwar, Marc Shandro, Nancy Maher, Steve Cooper and Stephen Sypher. It was a pleasure to complete this thesis based on all your contributions.

Last but not least, I wish to thank my family, in particular to my sister Shivaun for her putting her business coaching skills to such effective use in creating a thesis plan with me and for constantly injecting her unique sense of humour into the problems. I wish to acknowledge Aileen's English proficiency in editing this thesis and Miriam's absorption of other duties to let me keep my focus. I'm indebted to my mother, Doreen, for her abiding support, her intellect and appreciation of global issues, and most importantly for lighting the way for me with her prayers and candles.


Sinead E. O'Flanagan
May, 2007

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INTRODUCTION

This thesis follows the success story of the Canadian AccuMap company and its breakthrough innovative AccuMap® product, which was acquired by IHS Energy Canada in 2001. From the research it appears that instead of growing and flourishing following the acquisition and the consolidation of worldwide development resources into the global Information Technology (IT) services and systems group, the company's innovative capability has slowed down significantly in recent years. The purpose of this thesis is to answer the key question: "Does early success and market dominance help or hinder future innovative capability?"

We look at the story from the perspective of innovation capability, cultural integration leadership challenges and focus on acquisition. We examine the unique lessons that can be learned from AccuMap's success to date in a world where technological superiority, market dominance and strong company culture provide no guarantees without strong leadership and supporting strategies.

Seven core members of the IHS Energy management and senior developer team were interviewed. Each responded to the key research question and to the relevant areas of the seven supporting research questions, given in chapter 1. The responses are summarized in chapter 2 to chapter 8, under the relevant research question title.

Chapter 5 looks at the innovation cycle in terms of system dynamic behavior. The outline structure used is taken from a lecture on 'Managing through Discontinuities' which was part of the MIT Sloan 'Technology Strategy' course (Course No. 15.912) taught by Professor Rebecca Henderson.

Chapter 6 the organization structure is examined using the Organizational Congruence Model to review responses to thesis question No.6 "What are the barriers to innovation today?"

Chapter 7 looks at the overall thesis question, "Does early success and market dominance help or hinder future innovative capability?" taking into account the market dominance of IHS Inc as well as the former AccuMap company.

Chapter 8 contains the conclusions and recommendations on how IHS Inc. can become more innovative in its bid to be the global standard for enabling the best-in-class decision making processes in the oil and gas industry.

A literature review was done to help interpret some of the observations made from reviewing the collective responses. The case studies and research articles which describe challenges similar to those raised in the interview responses are included in the relevant chapters. It is intended that this brief literature review will provide additional insight to the reader and help to further interpret some of the observations made.

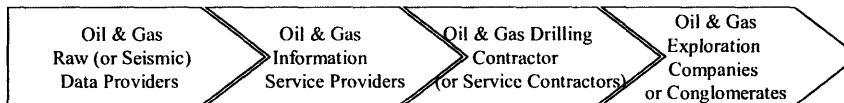
CHAPTER 1 - THE APPROACH TO RESEARCH

1.1 COMPANY HISTORY

IHS Inc is a US based company supplying critical information and services to five different industry sectors. Its annual revenues in 2006 exceeded 0.5 billion dollars. IHS Energy is one of its two main operating divisions of IHS Inc, along with IHS Engineering. IHS Energy is a leading information and service provider to the oil and gas exploration and production industry. The company is a global provider of well and production data as well as economic and consulting services. It supports industry professionals in over 90 countries in evaluating reserves potential and assessing the economic impact of political, fiscal and environmental risks. See website for IHS Inc., .

Historically IHS Energy has been a market leading data service provider rather than an innovation company, though it leverages the use of the latest technology to deliver world-class integrated solutions to its customers. IHS Energy strives to be the global standard for enabling the best-in-class decision making processes in the Oil and Gas (O&G) industry, not only in the traditional exploration and production sectors but in the transportation and downstream sectors of energy lifecycle. To see the role which service providers play in the industry, see the industry supply chain in Figure 1.1.

Oil & Gas Exploration & Production – Value Chain



Role of Uniqueness -Quality of data -Performance -Data Acquisition -Raw data processing -(Efficiency) Value Capture -Contracts -Regulation – Gov. -Proprietary data reselling -Selling industry knowledge (titles) -(IP) Complementary Assets -(Access to technology or expertise) -(R&D, Engineering, Service Network)	Role of Uniqueness -Streamline data & information -Seamless customer interface -Speed & Performance Value Capture -Contracts -Licenses -Up-sell -Packaging & cross selling Complementary Assets -Data processing & management -Alliances & partnerships	Role of Uniqueness -Rig Specification ..depth & pressure -Rig Performance -Rig Management -(Service & Performance) Value Capture -Contact -Availability of drilling rigs -Mobile skilled operators -Pricing power -(IP & Pricing power) Complementary Assets -# Drilling rigs -Management Org -Brand & Reputation -(R&D, Engineering, Service Network)	Role of Uniqueness -Geological Model -Geologists Skill -Compilation of data Value Capture -Use of exploration rights -Diminish exploration risk -Risk & return evaluation Complementary Assets -# of Licenses held -Accumulation of data -Proprietary data
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In 2001 IHS Energy Canada acquired QC Data, along with AccuMap which was known for its innovation capabilities. AccuMap is a Canadian innovation success story and the product, with over 80% market share, been market leader since 1993.

The AccuMap product, launched in 1991 was a flagship product which changed the way most exploration companies did business. AccuMap enabled geologists, geophysicists, engineers and land personnel to do in twenty minutes what used to take six weeks. Its speed and ease of use were revolutionary and thus it quickly became an integral part of the day to day workflow for exploration personnel. No other company managed to integrate the speed, functionality and data sets in the way that AccuMap has done.

In the recent three to five years, however, the innovation capabilities of the combined IHS Energy and AccuMap companies has slowed down significantly causing great concern to many in the company. In 2002 IHS Energy began integrating development efforts to replace a number of its legacy products, and moving many products to a new technology platform. The next generation of AccuMap was integrated into a new product called Enerdeq. According to the its webpage, , Enerdeq is “A data access and integration platform – a set of technologies and applications” providing access to all IHS corporate-wide data. However, despite Enerdeq’s launch in 2005 its functionality still falls short of AccuMap’s. Enerdeq, as a full replacement product, is scheduled to be completed by 2008, so as not to impose an artificial rush on this key transition. Replacement of other legacy products has also stalled.

One could argue that research and development (R&D) is being starved as the parent company, IHS Inc, is heavily focused on growth through acquiring other companies. Competition is catching up, as they improve functionality and include wider sets of data. Despite more than four years of effort to upgrade the platform the next generation products still struggle to quickly replace the full functionality of the legacy products. The technology problems are not trivial so the opportunity for another breakthrough use of technology exists. However, competition has not managed to match IHS Energy’s superior content or provide significantly better functionality, such as the provision of a fast and efficient ‘open’ data systems allowing customers to integrate their in-house data with IHS Energy content.

This thesis asks why the global IT services and systems group is not making more progress with developing the next generation products. What has slowed down its innovative capabilities, given its consolidation of resources and its history of success in Canada? Why are key development people now leaving the company in the U.S., U.K. and Canada?

Initially it seemed that the problem was about geographical cultural integration issues and differing leadership styles following the company mergers but while conducting the research it became clear that the company’s strategy of funding acquisitions through cost cutting in all areas including research and development (R&D) has significantly impacted the company’s ability to innovate internally.

In September 2006 Jerre Stead, who has held CEO positions in Ingram Micro, Legent and AT&T’s Global Information Solutions (NCR Corporation), took over as CEO for IHS Inc. Given his charisma and visionary leadership style, his clear and articulate vision of where the company is going has already created great optimism. R&D funding increased around this time, but it is yet too early to tell what the full impact of his leadership style will be on innovation at IHS Inc.

In May 2007, during the final stages of writing this thesis, it was announced that IHS Energy Canada was named amongst the top 50 ‘Best Workplaces in Canada’ by Canadian Business Magazine. This is a coveted recognition to receive. For many years AccuMap (which became AccuMap EnerData, then QCData_AccuMap, then IHS AccuMap, then IHS Energy Canada) has been considered a great place to work. This external recognition confirms this. Clearly the company retains a culture which is doing a lot of things right in the eyes of its employees, its customers and the competition judges.

1.2 THE TECHNOLOGY STRATEGY

In 2004, as the IHS Energy global IT development team considered how best to protect and grow the revenue stream coming from existing products, they evolved a technology strategy to reduce the number of disparate platforms essentially doing the same things. In terms of market strategy a greater vision was conceived, to create a product which would be the global replacement for the AccuMap and Probe products and become the definitive cohesive unified energy product platform, capturing the best of everything and addressing the needs of customers throughout all O&G producing regions. The idea for the new 'Enerdeq' product was born and the next generation of AccuMap and Probe would be integrated into it. For a representation of the expected transition in product performance during the migration to the new technology platform see the 'S- curve' diagram in Figure 1.2.

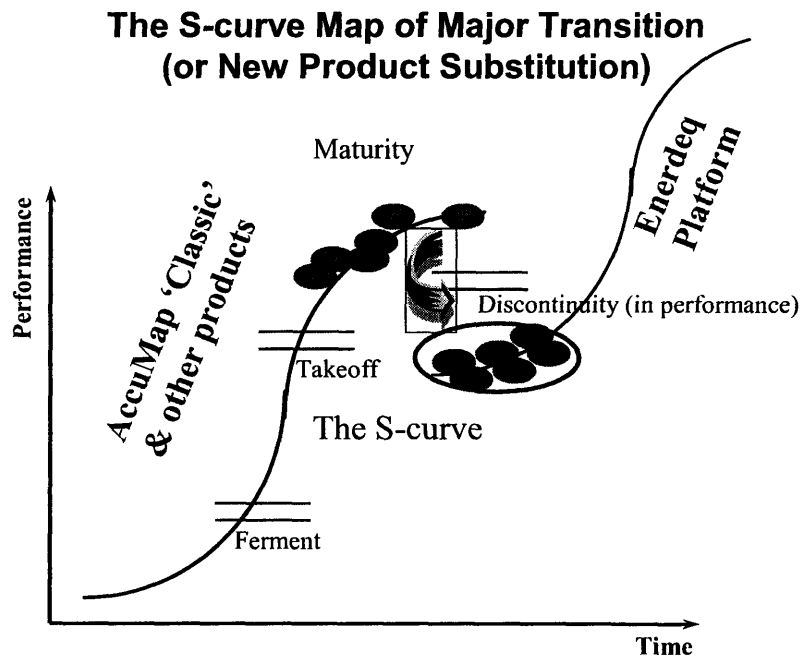


Figure 1.2

The S-curve shows the performance of a product over its lifetime. Typically performance dips when transitioning to a new product due to technology enhancements or other significant changes. Arguably you should not try to take an S-curve jump if you are missing the following, capabilities, assets, funding, ability to handle temporary decrease in performance (known as 'Worse Before Better'), or other entrants are significantly stronger. Best way to assess if you are ready, is to make the argument for not doing it and for getting out of the business entirely. If that argument can't hold then it is time to attempt the S-curve jump.

IHS Energy clearly has the capabilities to make the s-curve shift but it faces some classic challenges. The company has to be able to handle the discontinuity and run the two processes in parallel, side by side for a number of years until it can bring the legacy products to end of life. This is hugely difficult in the low cost model, which is where IHS Energy is. Limited funding for the old processes means that work on legacy products is increasingly restricted.

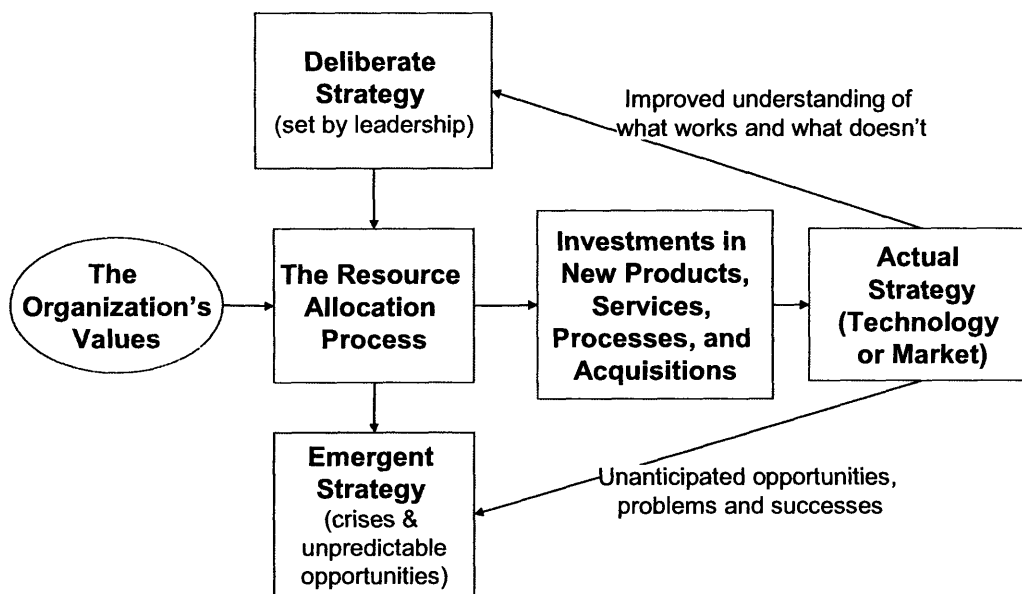
Enerdeq is using existing new technologies to undertake this project platform change. Given the immense scale of this platform development and the competing need for development resources to

support the legacy products, this project has challenged the company’s capacity for innovation. IHS Energy has struggled to manage the transition to Enerdeq.

Although Enerdeq had a compelling vision and strong support from the development community, the project didn’t seem to take hold in the new global matrixed, more complex organization. The project stumbled during 2004 and 2005 due to cut backs on expenses as the company prepared to go public. Even now, though the project is nominally the No.1 development priority, Enerdeq still struggles for resources.

The best way to examine the collective impact of various factors on the company strategy is to select a model for defining strategy. We can visualize the problem using the approach described in Christensen’s ‘The Innovator’s Solution’ in the chapter entitled ‘Managing the Strategy Development Process’ . See Figure 1.3. This shows that a company’s actual strategy is made up of what the company intended to do, its ‘deliberate strategy’, as well as what just happened which is the unintended or ‘emergent strategy’. When both aspects of strategy are combined and take into account the outcome is the company’s actual or strategy, which is significantly impacted by what projects resources are actually working on. We expand on this discussion again in Chapter 6.

The Process by which Strategy is Defined and Implemented



From Clayton M. Christensen, ‘The Innovator’s Dilemma’ -Managing the Strategy Development Process

Figure 1.3

1.3 RESEARCH AND REVIEW METHODS

The review method in this thesis is a descriptive style, interpreting events from AccuMap’s history of innovation and looking at its early success in the context of IHS Energy’s innovative capabilities today. From the key research question below, seven questions were derived. During interviews with key people from IHS Energy and the former AccuMap these questions were explored. The responses of the interviewees form a key part of the research and this is reflected in the corresponding chapters.

The names, titles of the seven people interviewed in this research project are given below.

Bob Banks:	Snr. Software Developer, IHS Energy (Canada) and member original development team at AccuMap Ltd., Canada.
Steve Cooper:	Snr. Director Strategic Technology & Data Quality, IHS Inc., and former CTO IHS Energy Ltd, Denver, US.
Chris Jones:	Snr. VP & General Manager, Canada, IHS Inc., and President, IHS Energy (Canada) Ltd.
Ganesh Murdeshwar:	VP Strategic Business Development, IHS Energy (Canada) Ltd. and former co-founder of AccuMap Ltd., Canada.
Nancy Maher:	Former IT Director, Product Planning IHS Inc, and previously IT Director, European Programs IHS Energy Group, (Europe).
Marc Shandro:	Former Director Canadian Software Development, IHS Energy (Canada) Ltd. and former co-founder of AccuMap Ltd., Canada.
Steven Sypher:	Director Production Data Systems IHS Inc., former Director IT, IHS Energy Ltd., Denver, US.

The thesis research questions were designed originally to focus on three specific business topics, Innovative Capability, Leadership and Cultural Integration. The issues discussed during interviews were, however, not limited to these topics. In addition to the seven research questions, more detailed questions were used to gather supplemental information. A list of these questions are given in Appendix 1

1.4 RESEARCH QUESTIONS

Each of the core group of people interviewed was asked to consider the key research question and the supporting questions which were relevant to his or her role in the company. Detailed sub-questions were used to guide the discussions where appropriate and compare opinions on specific topics (See Appendix 1). The responses to questions which are presented in the subsequent chapters are grouped in order to present the main recurring themes which arose from the research. Interviewee responses to specific sub-questions are not given.

Key research question

“Does early success and market dominance help or hinder future innovative capability?”

Seven supporting research questions

1. What were the essential components of AccuMap’s breakthrough innovation success?
2. How does the legacy of success help or hinder further innovative success?
3. How do leadership styles and values impact a company’s ability to create radically innovative products?
4. What technical and cultural adaptations were needed to integrate the AccuMap product into the Enerdeq product platform?
5. What lessons has IHS Energy learned in moving from a regional BU controlled software development function, to global, functionally controlled within a global matrix organization?
6. What are the company’s current barriers to innovation (in product development)?
7. How does the company become more innovative and develop more new high quality products faster?

CHAPTER 2 - WHAT WERE THE ESSENTIAL COMPONENTS OF ACCUMAP'S BREAKTHROUGH INNOVATION SUCCESS?

The responses to thesis question No.2, "What were the essential components of AccuMap's breakthrough innovation success?" can be grouped into the following four categories.

1. A visionary founder with a clear vision for the product
2. Optimized use of new technologies
3. Ability to overcome a harsh market slump - by understanding customer adoption behaviour
4. Evidence of early customer interest - through word of mouth marketing

In order to create some context in which these responses can be understood we look briefly at the company AccuMap and the AccuMap product evolution history.

2.1 THE ACCUMAP COMPANY HISTORY

In 1990 Malcolm conceived of and built the company AccuMap – a company that revolutionized the Canadian oil and gas industry. Malcolm received recognition within the Canadian oil and gas business as Entrepreneur of the Year and Calgary City Businessman of the Year and AccuMap itself was twice a finalist for Alberta's Science and Technology Awards.

Two of the four original co-founders, Ganesh Murdeshwar and Marc Shandro, continue their involvement within the company, playing key management roles up to today. Marc Shandro's departure coincides with the inception of this research project, 17 years after his tenure at AccuMap began.

The AccuMap product enabled geologists, geophysicists, engineers and land personnel to do in twenty minutes what used to take six weeks. It was the first tool that allowed a great amount of exploration and production information to be put on an individual's desktop and quickly analyzed. Its speed and ease of use were revolutionary and thus it quickly became an integral part of the day to day workflow for exploration personnel.

In 2002 IHS Energy began focusing more attention on developing the next generation of AccuMap with a number of the original developers from the AccuMap startup. The goal of the new product, Enerdeq, is to maintain the speed and ease of use of AccuMap Classic while enabling it to link into multiple public and proprietary data sets, beyond AccuMap's own datasets. Enerdeq was launched in 2005. It is still building its capability. So as not to impose an artificial rush on customers, the transition to the full replacement product is scheduled to be complete by 2008. AccuMap is scheduled to be kept alive until 2011.

The AccuMap company culture remained dominant in IHS Energy Canada for a number of years. As a result of this values based management style, IHS Energy Canada was named amongst the top 50 'Best Workplaces in Canada' for 2007. This recognition places IHS Energy amongst the top employers in the big oil town of Calgary where large Canadian and multinationals petroleum firms have a strong presence and continually battle for top talent. No doubt the company stands to leverage this success well.

2.2 THE ACCUMAP PRODUCT EVOLUTION HISTORY

In the early 90s analyzing oil and gas exploration data was slow and cumbersome. Geologists were using old manually intensive processes such as using paper 'PIX' cards (the equivalent of library cards) to create hand drawn maps. AccuMap was the first application to place this exploration

data on a pc so that it could be easily viewed and manipulated. According to former employees it was the first to find the sweet spot of usability for the primary geologists at the time.

Most of the exploration information was on these cards which were filed, one for every well that was drilled. At that time there were maybe 160,000 to 170,000 wells in the Canadian Western Sedimentary basin. The geologists would go to the library file cabinet, pick all the cards that are in an area representing all the wells, look at the cards for the coordinates relative to a section and then draw it by hand on the well location and then put whatever geologic formation that they were trying to map next to each well and draw contours by hand on it. It would take them one or two weeks to make one little 8.5 x 11 'flat map' as it was called.

To replace these hand drawn maps with a dynamic map, the early AccuMap tool used databases of the Canadian western sedimentary basin, compiled internally in the company, so it was a read only tool. As they didn't have to have a lot of the extra data base technologies they spent considerable time compressing the data base to make it possible to synchronize with the fast mapping engine which they were developing. They wanted an overall fast and seamless sort of browsing capability, to be able to generate maps very quickly anywhere in that region.

One of the original software developers, Hrvoje Lukatela, came from survey engineering background and had a personal passion for maps and that passion transferred into building this tool. He was convinced that the user experience was dramatically affected by how fast you could make a map on the fly. Hrvoje's focus was on making things extremely fast. To achieve his desired speed he believed the tool must be connected directly to data without having to preprocess anything. This required spatial indexing a sophisticated and complex model which retrieves a piece of data which is location based and places it on model of the earth that can then be mapped. Think of applications like Google earth. That's what his engine did almost 20 years ago. It used the underling mapping technology and data indexing technology which he placed in his software. For a more in-depth description of spatial indexing refer to 'Using a Geodesic Spatial Index to Improve Map Server Performance' .

What AccuMap did was put the beginning of a map on a pc (personal computer) in front of the geologists and that was their whole life. They lived and breathed maps. AccuMap gave them a tool to come up with a map and that was a huge chunk of their work flow right there. From there on it was very intuitive, you just had to learn a couple of clicks to navigate the map, to zoom in zoom out, to get well information and so on.

2.3 A VISIONARY FOUNDER WITH A CLEAR VISION FOR THE PRODUCT

Founder James (Jim) Malcolm recognized the commercial opportunity that existed in building a tool which allowed oil and gas exploration data to be analyzed more quickly and easily by geologists and other exploration data users. His vision was to create a significantly improved user experience when it came to creating maps for oil and gas exploration. His vision was so simple and so clear that all former AccuMap employees were still easily able to describe the vision and relate to their role in helping to create it.

According to a former employee Malcolm always emphasized listening to the customer and giving them what they wanted. He recognized the importance of high quality data. He knew that he had to have strong business associations with data vendors, and if possible, tie them up with exclusive contracts so the competitors could not get the data. He was seen as "rock solid" when it came to expressing the high level goals and especially the values of the company, yet he was considered quick to adapt to changes in partners, data, associates and high level technology.

The early vision for the product was a joint vision with fellow software developer Hrvoje Lukatela. This vision meant solving a number of tough technology questions. The breakthrough solution was found using a combination of new technologies, each of which was available at the time. Malcolm's philosophy was "if we build a quality product, the money will take care of itself." This

belief grew into one of the cornerstones of the AccuMap company culture and it is often repeated by former AccuMap employees who remain part of IHS Energy today.

The technology details were generally not in Malcolm's purview and according to one developer "When they were, it was often a mistake.... He had some technological whims that were a little costly at times." This experience appears to have cultivated a healthy approach of challenging the status quo when it came to technology decisions.

2.4 OPTIMIZED USE OF NEW TECHNOLOGIES

AccuMap was the first application to place this exploration data on a pc and its increase in speed represented a quantum leap compared to other offerings. Although there were other pc solutions before AccuMap it captured and maintained first mover advantage because no-one came close to matching its speed, even today. Back in 1991 the competition tended to have project based maps, not dynamic maps. Users had to select the area using option menus, go to the next level, choose further options and so on to download an area and then wait 20 minutes for the map to be displayed. It could display a map of any area in real time, say 5 seconds. The AccuMap application was a radical improvement over existing manual processes.

Although none of the technology was new, the breakthrough came from the combination of different aspects of product enhancements which was seen by many as "a winning combination for customers".

- Usability – Ease of use of the product was one of the top priorities. In terms of simplicity it was ahead of its time. There wasn't any moment of brilliant insight that said ease of use will win the day but Malcolm passionately believed in this approach and it was really emphasized among developers. The interface was sort of a graphical user interface (GUI) and this meant it was easy to make a map and inspect a well. None of the competition at that time had that approach. Nearly everyone uses it now.
- Speed – AccuMap utilized various software tools that were vastly superior to their competitors in terms of speed, in particular the Spatial Engine software. The fast data access was then built on top of the user interface and the functionality. It was like their own data base build. The overall application speed was orders of magnitude greater than other applications, especially broad regional queries.
- Data compression – a variety of techniques were used to compress AccuMap's data set to a significantly smaller size than its competitor. This allowed developers to fit more data on smaller hard-drives. The smaller size resulted in faster install times and increased product performance during runtime benchmarking.
- Media – AccuMap was the first product to use CD's as a delivery mechanism. This is commonplace now, but at the time it allowed the company to deliver more data faster and easier.
- Development tools – we used more powerful programming languages and tools that allowed us not only build code in shorter time, but most importantly, allowed us to relatively quickly enhance the code based on user requests. It's also felt we had fewer bugs.
- Ease of deployment; the software and data were tightly integrated. The spatial engine and the GUI were the two home grown technologies in AccuMap. Either technology alone would not have been enough to distinguish the product. The technology success came from embedding the spatial engine software into the compressed data sets within AccuMap. The tight integration meant the application was easy to deploy.
- Integration of essential data in one place which overtime locked customers into use of the tool. The fact that pc's were becoming ubiquitous played a large part in how AccuMap optimized the use of technology at the time. Geologists using AccuMap had a desktop mapping tool that could

build a map on the fly. Once the map had been drawn, it could be moved in 5 sec, without creating a new project. Using the old project based systems, if geologists wanted high quality maps they called the mapping bureau and ordered it with various layers showing. The mapping bureau then loaded a Computer Aided Design (CAD) tool with the requested layers. The pc allowed desktop mapping, which worked in seconds and was as accurate as CAD. Geologists had AccuMap for the cost of twenty CAD maps.

Developers seemed to have learned early on that the most significant mistake in a start-up is to be too concerned with creating a breakthrough in technology. That alone doesn't create value. One of their development philosophies was "put as much in as you need to solve the problem and no more". The company became successful when it used the technology to create a process for end user, thus they found a way of turning it into value for the customer.

With a reduction in process time from 20 minutes to 5 seconds detailed benchmarking didn't matter. In the early AccuMap days ad-hoc benchmark proved to be more than adequate. Developers were able to see competitive products in action at install sights and could visually gauge product performance, e.g. map drawing speed, query speed etc. When it came to usability, customers told AccuMap developers what was bad in the competitors' products and developers built it better. There was no strict quantitative measurement of usability other than informal feedback, plus the survey results from hundreds of users, based on questionnaires handed out at open houses and trade shows.

2.5 ABILITY TO OVERCOME A HARSH MARKET SLUMP - BY UNDERSTANDING CUSTOMER ADOPTION BEHAVIOUR

AccuMap was the first product on the market to provide clear advantages for geologists and other users in terms of speed and usability, yet it was two to three years before sales took off. The company AccuMap was "the new kid on the block" and they were "taking on the big dogs" in the Canadian oil and gas services business. They had to clearly distinguish themselves in the eyes of the customer.

Thus the AccuMap early team had many challenges to overcome in terms of customer adoption and a harsh market slump. One overriding reason for the slow uptake of AccuMap was in 1991 the Oil Patch was in a slump similar to the Silicon Valley of 2004. AccuMap was launched in a major market downturn. It was post National Energy Program (NEP) days, a program introduced in 1980 which destroyed Canada's Oil Patch. For more details on The NEP see on-line discussion forum related to 'Developing Alberta's Oil Sands: From Karl Clark to Kyoto'. Commodity prices had come down and at the same time costs were sky high. Alberta was at end of this ten year post NEC cycle and large oil companies were laying off thousands of people.

As a result of harsh financial environment geologists, even the early adopters who saw an immediate need for it couldn't buy AccuMap unless it replaced something else in their budget. Addressing this constraint was one of the main challenges that made AccuMap so successful. AccuMap was not a strategic imperative, so instead of developing an aggressive sales approach, the sales people and developers listened very closely to customers.

According to one of the original AccuMap developers, "The product was so radically improved over existing manual processes, and the industry so entrenched with computer illiterate elder statesmen, that it was sometimes hard to convince potential customers that our product would save them vast amounts of time. Once convinced, we had to overcome hurdles such as teaching users how to work a mouse. We even had users phoning in asking why the product doesn't show up on their screen, when the answer was simply "turn on your PC". Other difficulties were luddites and tree killers who clung to old products such as paper "PIX" cards, hand drawn maps etc. Other difficulties were the fact that our data partner also sold competitive "PIX" cards, the old technology, so their products were fighting each other."

According to one former employee people immediately saw its value. However, even though the AccuMap application was so much more convenient, it wasn't enough because geologists needed all the information on a well to create a picture of what is happening. One customer might say "The application is great but we need to add our tops data ('tops' refers to the top of a geological subsurface formation). Another might say "Yeah great, but we can't replace (the existing system) unless we add production data". From there a customer might say "Yeah that's great but I can't get rid of all my (Pix) cards for Tops. We have government data there but if we can put our data it would be much better". So developers loaded their tops data. Then developers added land data and so on.

Each customer had some unique needs. Many companies needed their own critical data sets included in the database. This was often managed by finding the source of the data, getting into a partnership and then putting all the data into AccuMap. It was sort of orchestrated adding of data sets, one at a time. As developers fleshed out the different data sets it becomes more of a complete offering so that users didn't have to go to all these different systems to get data like pipeline data, gas analysis, pressure data, core data, production data or land data.

Developers assessed what priority to give the customer requests and fed it back into development cycle right away. Sticking points were immediately addressed such as getting printing capability for large plotters. Thus they had created an immediate feedback loop between sales and developers. The first version of AccuMap was fairly basic, all it had was wells grid but it still legitimately looked like a map. Through the summer of 1991 the developers built the product according to what was going to get one customer to fully adopt the product. Knowing every detail of what it took to get a customer on board created an application that became the market leader for over a decade.

Another developer recalls their close links with customers. "We were doing customer support, so if we put in something difficult to use we had to take phone calls. We built it so that no-one has to ask questions as to how it is used. If we ship out a feature that was unclear we are suddenly in a negative reinforcing loop, 'boom', the next day we are swamped with calls."

Service companies were also feeling the massive pinch of the "glory days" being gone. While some were like the phoenix rising from the ashes, most were still hurting. It was about survival so it's safe to say their products had been static for a while. AccuMap's approach was revolutionary. It combined the use of new technologies such as digital data, map based interface and new CD media for sending out monthly digital updates amongst other things.

2.6 EVIDENCE OF EARLY CUSTOMER INTEREST - THROUGH WORD OF MOUTH MARKETING

The oil and gas industry in Canada is a very tight knit industry with almost everyone working down town in Calgary. Jim Malcolm's approach to marketing was to have a well respected and well connected geologist friend start introducing AccuMap while he was doing his geology work to thus get it into a few places. Through this initial sales process, they got some key installs and did demos in about a hundred companies within the first year. Word of mouth really helped a lot in finding other early adopters. When people had it they really raved about how much easier it was for them to use compared to manual maps.

Although it had first mover advantage with respect to providing application which was a quantum leap ahead of its competitors in terms of speed and ease of use, it was still the new kid on the block. For that reason throughout this time Jim Malcolm felt he should target sales at small companies and the company concentrated on that market. However, developers continued to pay close attention the needs of the bigger customers, such as Renaissance and Pan Canadian knowing that if they could sell to them it would be a real vote of approval from a leader in the industry.

Suddenly, in December 1991 Pan Canadian one of the biggest local oil companies at that time said "This is great, we want unlimited licenses." This took AccuMap from being a startup to being a major player. It was a classic moment of "Crossing the Chasm", where the company finally begins to

sell its product or service to “the early majority” of customers. Although it had taken a while for the momentum kick in, with 2-3 years of its launch AccuMap sales really hit the hockey stick inflection point.

While the eventual sales growth came relatively quickly it was still longer than originally anticipated by the company founders. During the early years there were also capital management challenges because of over optimism in the product. The company didn't have enough cash to survive as long as it needed to. It took longer than one or two years for sales to break even. Malcolm went back to investors, many of whom were family and friends. He didn't have to work really hard to show them the niche market potential in order to bring in additional finances and he still had full control over the vision and direction of the company. Malcolm had originally envisioned an exit strategy, to sell to partners after two years. That didn't happen in '94/'95, because of the fun and success they were enjoying.

2.7 LESSONS FROM LITERATURE

In ‘The Business of Software’, Free Press 2004, Michael A. Cusumano provides an eight point list of ‘Essential Elements of a Successful Start-up’. Not surprisingly this list maps well onto the elements that contributed to AccuMap's early success, listed at the start of this chapter. Not only are these elements common among successful software start-ups, they highlight the skills that team members developed collectively, skills which should be fully leveraged in the global matrixed organization if the company wishes to remain or become more innovative.

1. A Strong Management Team
2. An Attractive Market
3. A Compelling New Product, Service Or Hybrid Solution
4. Strong Evidence Of Customer Interest
5. A Plan To Overcome The Credibility Gap
6. A Business Model Showing Early Growth And Profit Potential
7. Flexibility In Strategy And Product Offerings
8. The Potential For Large Payoff To Investors

While it is common to find 5/8 or 6/8 attributes present in a group or company, what differentiates the successful company is having all eight elements present. A number of the elements which contributed strongly to AccuMap's product development breakthrough success are still relevant in the larger matrixed global organization of IHS Inc. today. These elements are summarized below with the element they correspond to from the list above.

- Having a visionary leader, who clearly communicates and doesn't change his mind on the big picture goals. (Element No.1 - A Strong Management Team)
- Listening to the customer, focus on quality and lock in your key data vendors or partners. (Element No.3 – A Compelling New product, Service, or Hybrid Solution)
- Understand the constraints of the early product adopters and work tirelessly to overcome these constraints. (Element No.7 – Flexibility in strategy and product offerings)

Some of these elements or attributes are missing today or gaps exist in the company's ability to carry them out effectively. Here we consider some of the points taken from Cusumano's discussion on ‘What to look for in a software start-up’. The references to CEO, founder or entrepreneurs are

considered relevant to the managers, developers and other stakeholders involved in the global IT group at IHS Inc.

“Founders who want to become CEOs need to develop management skills, such as listening to others without being overly intimidating, accepting different points of view as objectively as possible, deciding how to allocate resources (people, time and money), and avoid what I call “panic management.” The last item refers to the tendency of novice managers to respond to the latest crisis each day and lose track of the bigger picture.”

“Some software entrepreneurs are more deliberate than others in how they go about finding that compelling product concept. They may have a deep familiarity with a particular technology and then spend some time analyzing the market space before they identify a customer need that remains unfilled or poorly met. Bill Gates and Paul Allen did this with Microsoft when they identified the need for programming languages for PCs. Jim Clark and Marc Andreessen did it with Netscape when they identified the need for commercial-grade Internet browsers and servers. Bernard Liautaud and Denis Payre did it with Business Objects when they identified the need for simple data base analysis, query, and reporting tools that ran on personal computers and targeted non-expert users. Sanjiv Sidhu and Ken Sharma did it with i2 Technologies when they identified the need for better factory and supply-chain planning systems and found a way to package their unique optimization algorithms.”

“One way of evaluating strategic flexibility is to talk to the founder and the management team, and try to understand how they think about different options and how rigid their personalities are. You have to make guesses about people. The flexibility of the technology or product is often easier to evaluate objectively. For example, you might want to know how tight the code is tied to a particular platform and programming interfaces or how generalizable the architecture or functionality is. Has the team thought about what else could be done with the technology it is building and the technical skills it is cultivating?”

These quotes are included for the consideration of those seeking to create a more highly innovative environment at IHS Inc today. It is my opinion from conducting this research that innovative success depends on the above gaps being addressed.

CHAPTER 3 – HOW DO LEADERSHIP STYLES AND VALUES IMPACT A COMPANY’S ABILITY TO CREATE RADICALLY INNOVATIVE PRODUCTS?

The leadership styles and values at IHS have changed a lot as the company has had three CEOs in five years. While all people interviewed agreed that different situations require different leadership styles and attributes, it is clear that the styles and values that existed in the past five years at the top leadership level were seen as not actively promoting innovation in the company, until changes occurred in late 2006. The question is what impact have the various leadership attributes had on innovation in the company and how is the emerging new leadership style impacting the organizations ability to innovate going forward? Responses to research question #3 have been grouped into five categories listed below. Before describing the styles and values we look at the leadership changes that have taken place in IHS Inc and IHS Energy in recent years.

- Leadership vision
- Leadership risk taking and empowerment
- Leadership discipline
- Leadership integrity and communication
- Leadership decisiveness and support

3.1 CHANGE IN LEADERSHIP

Change in leadership is not just inevitable it is essential at different times for different reasons. Under CEO Bob Carpenter (2000 to 2004), ‘the Carpenter era’ as it is referred to, the company demonstrated its ability to focus on finance and radically reduce costs. Carpenter’s focus on the company’s finances using his iron disciplined style was consistent with his goal of preparing the company for its IPO. Carpenter was seen by some as the right guy at the right time. He created the much needed discipline on expenses, which helped position the company for growth.

Following the four year Carpenter era, Charles Picasso took over as CEO in October 2004 to September 2006 when he retired. Picasso continued the strong focus on finances as he lead IHS through its successful initial public offering in November 2005. Under his leadership the company continued to grow steadily, primarily through strategic acquisitions.

As Picasso prepared to retire in September 2006, Jerre L. Stead, who had served as executive chairman of IHS since December 2000, became CEO. People agree that this newly public company needs someone with a clear vision, who is good at articulating vision and motivating people to grow and develop the company. Stead appears to be that visionary leader that people were hoping for. Each of the core group of interviewees has high expectations of Stead. He has a strong, charismatic personality and his proven track record of leading successful organizations has been widely publicized. For more details on Jerre Stead becoming CEO, see the IHS Inc. website . Despite the break in continuity that comes with yet another new leader optimism is very high.

Here we look at the company’s ability to create radically innovative products. When IHS Energy acquired the Canadian company AccuMap in 2000 it acquired a highly successful innovative development team, with a proven track record of bringing innovative products onto the Canadian market. In 2003 that development group, which had known a decade of success as an independent group under local Canadian leadership was merged with the newly formed worldwide IT development group based in Denver and the development group in the U.K.

One commonly understood goal of the worldwide IT services and systems group is to protect the revenue stream through consolidating products and creating the next generation of highly innovative products to replace the current aging ones. When looking at the leadership styles necessary to help create innovative products in the company, strongly different views emerged on what role innovation plays in IHS Energy. People hold different views on what attributes a leader needs in order to

manage innovation. There are also widely different views on which leadership attributes are relevant today.

The one thing everyone agreed on is that there have been many delays in bringing Enerdeq to market and time is running out, as the legacy products are barely supported. Significant work still has to be done to complete the effective integration of the development groups which began in 2003.

3.2 LEADERSHIP VISION

The first agreed leadership attribute, is the need for a clear vision of where you want your new technology to be. A leader ensures that the group never loses sight of that vision and the end goal. According to all those who had been part of a successful innovation team for more than a decade the leader's vision, the values and the high level goals should be kept as constant as possible. The leader needs to understand the future technological changes and create a clear picture of how the company is going to respond to those changes. The vision must take into account the tradeoffs that will be necessary, particularly where you have a high number of revenue generating legacy products. Leadership has to be able to communicate this vision to all customers, explaining clearly why there is a technology shift.

Some feel that to keep the ability to innovate really alive in the company, developers really need to know what customers are doing everyday. The leader has to create a strong vision of a bold step forward, such as taking a customer task that currently takes hundreds of hours and figuring out how to do it in tens of hours. With that kind of vision the developers can tackle and solve the tough technology problems. Without that kind of bold vision, some believe breakthrough innovation won't occur within the company.

According to others, in order to foster new innovations within the company the leader needs to understand the life cycle, including 'Crossing the Chasm.' This refers to the work by Geoffrey A. Moore on marketing and selling high-tech products to mainstream customers. According to those interviewed the leader needs to understand the importance of finding early adopters, finding where you are in that cycle and where your customers are in their adopting behaviors. IHS Energy has to replace AccuMap by starting with the customers whose adoption behaviors are fully understood. The leader needs courage, resources, money and people. There is a belief that IHS Energy hasn't done this well so far. Some feel it is because the company hadn't the ability to carve out or to fuel R&D work. The purpose of investments has always been to generate short term revenue, within a known framework as opposed to an unknown one. In order to innovate there is a need to explore. IHS never had that (exploring) culture.

The early decisions around the replacement of AccuMap give an example of this type of exploration. Replacing AccuMap began to be considered as far back as 1999, prior to its acquisition by IHS but at that time no clear plan had emerged. As the company began to resource the project in 2000 it headed down a specific technical path. In 2002, due to changes in the market and technical limitations of the chosen software, the company stopped its then technology choice and decided to develop the next platform using .NET and C-sharp. Those technology decisions remain in place today.

In 2003 when it came to integration of the development teams into a worldwide IT group the leadership vision needed to include how to bring the teams together and how to shift the groups towards a more global view. Most of the core group of interviewees, listed in Chapter 1, agreed that there has been lack of clarity and motivation around global goals. This has resulted in lack of focus on resource related issues, particularly when it comes to innovation. However, all agreed that Stead, the new CEO, provides clarity and motivation around his vision for IHS where customers are number one and people are the most important asset. Many see that with his vision and ability to motivate he can shift people towards taking a more global view of where the company is going. As one person put it "with Stead the talk is good, now it's a case of walking it."

In 2007 strategic plans from the executive leadership have been radically adjusted to promote a more global view in all regions. Up to 2007 implementing such global plans hadn't been successful because management teams' incentives were focused on growing profitability in the regions. Most agree that one of the biggest issues, from a management and leadership perspective is that to act globally the company has to create globally focused incentives which are aligned with the leadership vision. A number of managers feel that they have struggled to effectively integrate matrixed groups in the global organization and they believe they would benefit from a better understanding of how this global view fits in with regional processes so that they can make more informed decisions when setting priorities.

Most of those interviewed believe that the leader's vision needs to clarify how the demand for short term growth in this newly public traded company is going to be balanced with achieving longer term product development goals in the cost cutting environment. The company's goal is to keep costs down while adding to the top line, but growth is constrained by the need to add acquisitions or grow internally while keeping margins bigger than the current margin level, which, in Canada is close to 50%. At the same time the company is at risk of losing revenue to competitors within two years if customers drop existing products, because replacement products don't have full functionality. This year's focus on Enerdeq as the number one development priority is the first step in addressing this challenge.

3.3 LEADERSHIP RISK TAKING AND EMPOWERMENT

There is a fairly widely held view that the leadership needs to take more risk in empowering employees. Tied to that need for empowerment some see the critical need for leadership development programs, which the company has just begun to roll out. According to one senior member of management; "At different levels of leadership we ask people to step up and then step up another level in more of a global context. We make assumptions that they can." Senior members of management see the company's leadership development programs as absolutely essential to help people develop the skills they needed to do the jobs that are being asked of them.

Some see that a company's ability to innovate requires leaders who promote constant learning and a sense of exploration among developers and related groups. The leader must have the ability to trust employees and an example of that trust is to leave the core technology decisions to those that know it, namely the developers. On the other hand the developer needs to recognize that exploration and risk taking should not include technical advances which are so new that they introduce uncertainty and unknowns into products which replace a highly stable product suite. Leadership focus on education of employees is considered critical to a company's ability to produce highly innovative products.

While some employees believe that IHS Energy has allowed developers to make many of the core technology decisions, most feel that overall the leadership lacks trust in its employees. Some executive leaders still use a command and control style or a dogmatic or dictatorial approach. Some employees feel sheltered from this style of executive leadership by their immediate supervisors but most agree that it drains resources, creates turnover and ultimately leads to delays in development and weakens the company's ability to create strong innovative products.

Most of the interviewees agreed that a company's ability to innovate requires the software developers to be closely linked to the customers. Today the company's product managers represent not only the voice of the customers but that of the competition as well. Many believe that the fewer people in between customers and developers the better and thus the key to success lies in how well the product manager and developers collaborate and work together. Most agree that the gap between them needs to be narrowed. Visible leadership support is essential given that many product managers now operate on a global basis, with functional as well as business units and some are struggling with different markets and different products.

Some believe that product managers haven't always been equipped to make decisions, for example if a customer segment started to drop the product, the product managers might not have access to the support they need to quickly address the problem. The role of leader is critical in keeping everyone sharply focused on these issues. In the recent integration the leadership admittedly did not focus adequately on this area. This has changed and in recent months. Leaders have begun to engage all stakeholders more extensively so that early warning flags are raised they can respond quickly.

3.4 LEADERSHIP DISCIPLINE

Opinions vary strongly as to the need for strong discipline. Most agree that when leading innovation in an established company with market leading legacy products it's harder and more complicated to make a technology jump compared to being the new kid on block. The leader has to know how to maintain market share with the high number of legacy products in order to stay profitable. At some point you will not have the skill set to support the product or the software won't be available to continue to maintain the product. The leader needs to have an exit path for current products which internal people understand, especially when you are the market leader with a dominant market share. This closely connects to the need for the leader to clearly communicate this vision for the technology shift to all customers.

A leader is seen as someone "who explains the vision and then puts the right people in the right place to make it happen". All agree that a leader needs to validate how his or her vision is being implemented. This needs to be done, not just in terms of numbers, but in terms of other deliverables too. There are widely differing opinions as to what the other deliverables should be and how they should be validated. Some feel that key performance metrics are important and development can't take place without them. Some argue that there is no real difference between the leadership approaches required for leading a pioneering technology change versus managing a sustaining operation as all critical goals have to be accurately measured so the leader knows what has been done and where the group is against stated goals. Others argued strongly that overemphasis on operation style, measurement and adherence to schedule did not allow for any creativity or innovation.

According to one interviewee "If you take on technology or innovation projects you have to set hard and fast deadlines, with a deliverable that you can actually feel and say yes it's been met, or no it has not. From that perspective software technology is not any different from operations or services either... If you go with a technology project are you meeting deadlines, are you delivering what you promised when you promised and at the price you promised? It's about breaking it down into manageable pieces, particularly with software. Every task can be reported as on time or on target and then, as happens so many times, it is all blows up a week before scheduled product delivery. Suddenly you find half the stuff hasn't been done. The problems boil down to not being able to adequately measure what was done."

Others take the opposing view that you can't build highly innovative products which customers really love on a fixed schedule and a fixed budget. These are seen to be mutually exclusive. In fact some go so far as to say that imposing a project framework on product innovation, with budgets and schedules and rigid parameters is heresy. Some argue that this is a product not a project and it has no fixed end, you can evolve it forever. The only budget for the development should be a maximum spend budget along with the corresponding set revenue expectation. Success should be defined by customer satisfaction, which translates to financial success. If leaders consistently use operational type metrics to monitor development, they place too much emphasis on deadlines and budgets and don't allow for exploration or organizing and building innovative products organically based on a high level of continued customer interaction. This view was echoed by other developers who felt that the company won't make money on innovation by "saving a buck on the budget" Innovation requires the idea of spending money to make money.

Leadership focus on process monitoring, performance increase and cost control are considered to be more critical when a company is sustaining its technology advantage. There are individuals who believe that the leader needs to focus on controlling cost when it comes to sustaining technology advantage. According to one interviewee “That becomes the tight rope the company has to walk across. When you have legacy product that evolves into a new technology the leader doesn’t want to segregate groups, to pigeon hole teams working on the old technology and marketing efforts, and bring a whole new set of skills to take the new technology forward”. This is seen to require good public relations to ensure that everyone has career opportunities internally. “The leader has to find the right mix, of those comfortable to step up to new technology and also to find those who are very comfortable maintaining the old. It comes down to knowing your staff well.”

According to one member of senior management “You need to stay aware of competition, in two ways, firstly on product features, and secondly on business strategy (which trumps product features). There is no room for complacency. It is generally felt that IHS Energy has put a lot of focus on this and has done reasonably well. Everything is really important including getting the red flags as a leader. Something may be seen as obvious on the ground but you want the bad news, the warning flags and you want to get them early. This can be seen as a cultural issue where communication is key.”

3.5 LEADERSHIP INTEGRITY AND COMMUNICATION

Integrity is a leadership attribute that is expected in all businesses. Some feel that IHS has gone through stages in the past where this integrity may have been lacking, or at least the communication wasn’t adequate to convey a sense of integrity throughout the organization. In the past there wasn’t a sense that people were all focused on the same objective. It came down to lack of consistent communication, which was perceived as lack of integrity. People were not always sure that the same message was being given in different places and it was widely agreed that this resulted in a lot of confusion and ultimately bad feelings. This commonly held perception made it a lot more difficult to work together towards creating unified and innovative products for the customers.

According to one interviewee, there are three components to consider when integrating an organization. The first component is a well defined organizational structure, the second component is clearly defined roles and responsibilities, and the third is ability to effectively communicate. The third component is so fundamental that it can compensate for lack of effectiveness in the other two components. The organization structure should be irrelevant in a way, but clearly defining roles and responsibilities is always important. This aspect was very challenging when IHS transitioned from regional business units to a matrixed organization.

Overall interviewees believe that as a whole transition didn’t go that well. Everyone agreed that the leadership needed to pay more attention to understand and accommodate the differences in culture, particularly geographical cultural differences which became amplified within the integrated groups. There was no clear model to follow when integrating the team and the company needed someone sensitive to work through the issues. The cultural issues were never really resolved. For example, when management of the software development group based in Calgary was transferred to Denver, the Canadian executives had to trust the corporation to look after all aspects software development and avoid judging what was happening, from both a technical and a management perspective. The problems were no longer theirs to fix. It was a very challenging time and, according to one senior member of management, it required a lot of personal adjusting for those involved.

3.6 LEADERSHIP DECISIVENESS AND SUPPORT

In order for the merged development to focus on a common objective the leader needs to decide what the group is doing and how it is going to do it. The need for decisiveness follows on from having clarity around vision and strategy. Rather than letting things evolve, the leader, it is believed,

should make the tough decisions, makes them early and articulates them clearly. Tough decisions include ones like finding funding and resources for a new product, getting rid of a product or a team, or facing down resistance to an already agreed upon organizational or structural change.

Taking the tough high level decision is considered one of the main attributes of a strong leader and it clears the way for groups to focus their work, which in this case is innovation. People agreed that there was a lot of early resistance to the change and there were no repercussions where there was resistance. A decision needed to be made to address the resistance along with acknowledging and fixing the underlying cause of the resistance, which mostly related to cultural differences in how things were done.

The development group in Canada had always been very closely connected to and actively supported by the leader. Innovation and product development had been the sole focus of the former AccuMap company thus the Canadian developers had always enjoyed high visibility within the local organization. Meeting their needs was a priority with their leaders. In contrast the development group in Denver was one of many groups co-located within the corporate headquarters. As such they did not enjoy the same visibility with the company's leadership, despite being close to them geographically. Leadership support for development work, particularly from CEO level, was usually difficult to get, because traditionally development work at IHS lacked the strategic importance compared to acquisition activities.

From the interviews it is not clear how strategically important product development work is at IHS Energy. Finding resources for a new development project such as Enerdeq has been difficult. Some feel that decisions about assigning resources to build Enerdeq seem to have been made organically at some arbitrary management level. The evolved decision appears to be to complete building an early version of the Enerdeq and get it to market as soon as possible with the minimal number of resources possible. Under-resourcing the new product, launching it when it is far from a replacement product and arguably under-resourcing the legacy products too left the development groups with extra challenges as this greatly extends the transition time. It appears that the decision was never explicitly made or that no one has particularly thought it through. Perhaps it is because of changes in leadership that the decision arose organically or perhaps despite the cash available for acquisitions, the company was not willing to direct the necessary funding to R&D.

One interviewee felt strongly that the way to decide where resources needed to be placed when transitioning from old to new products was to pay more attention to competition and customers. "If you do that you know exactly what money and resources to place, where, and especially when." This means that leadership support for the product managers and others who represent the voice of the customer is critical to a company's ability to develop highly innovate products. In Chapter 6 we expand on this discussion, looking at how the product reflects the actual company development strategy.

A number of those interviewed seemed to have responsibility without real decision making authority when it came to overcoming integrating challenges. Support from more senior management was not visible and strongly differing opinions resulted in clashes which became unnecessarily personalized over time. In these cases strong, visible and decisive leadership was required. People wanted a leader who would say "look guys this is what we have to do...now let's figure out how we are going to do it". A culture of conflict can be constructive if it is accompanied by trust. In Chapter 6 we expand on this idea in discussing how to create an organizational structure to support innovation.

3.7 SUMMARY

From the responses detailed above the following list summarizes, in no particular order, what interviewees considered to be the most important leadership styles and values, which impact a company's ability to create radically innovative products. There are a number of recurring themes in this list and these issues are reviewed further in Chapter 6.

- Set and articulate a clear vision
- Align incentives to top objectives
- Guide functional management in aligning short term cost controls and long term strategy
- Set up monitoring with flexibility
- Communicate frequently and openly
- Empower employees
- Ensure high level of responsiveness to customer and competition

CHAPTER 4 – WHAT TECHNICAL AND CULTURAL ADAPTATIONS WERE NEEDED TO INTEGRATE THE ACCUMAP PRODUCT INTO THE ENERDEQ PRODUCT PLATFORM?

4.1 GOALS OF GLOBAL PRODUCT DEVELOPMENT GROUP

In order to figure out what technical and cultural adaptations were needed in the organization beginning back in 2004, it is important to look at the goals that were set by the executive team at that time

Everyone agreed that one of the major goals of the integration was to protect existing revenue stream. People seemed to be clearly focused on that. A related goal was to replace the AccuMap product with a new product within a three year timeframe. According to one interviewee “One of the advantages with redeveloping a new platform is that you know what you’ve got to develop”. Another interviewee said they began the project with a broad idea of what they were going to do but without a clear plan of how they were going to do it. There was general agreement that there would be technology alignment between different groups where possible. The company appeared to struggle with that alignment perhaps because of lack of clear goal setting at a tactical level.

However, there was a sense that all regional VPs as well as leaders of the worldwide IT services and systems group were involved in the decision to build the Enerdeq product platform. Supposedly they all understood the costs and how much of the resources were going to be diverted to accomplish it. Those interviewed from the US office believed that the regional business unit in Canada stayed more closely connected to the evolving goals of the global IT group than other regional counterparts in the U.S. and Europe. The Canadian leadership team appeared to know what was happening. Yet the Canadian management felt quite removed from what was happening relative to their previous level of involvement.

Another commonly understood goal was that of completing acquisitions. IHS has always had an active strategy of acquiring companies to support its global growth plan. This strategy is well funded and it is seen as the #1 company priority. The cost cutting of 2003 and 2004 was seen as a necessary part of funding these acquisitions, in order to maintain growth.

In 2004 the company had begun planning its IPO and it set ambitious global goals for this. Many people felt there was lack of clarity on how these global goals would be achieved. Some felt that there was significant conflict in terms of global versus local goals as differences in possible strategies appeared to exist. For example, once the matrix organization was put in place there was no clear alignment between business unit goals and the then worldwide software development goals. It became a question of balancing resources for AccuMap versus resources for new products, which was a challenge, even for the strongly allied Canadian leadership team.

There is general agreement that in 2004 these development goals were not as visible or as well understood at CEO level as they could have been. At the time Carpenter’s focus was very much on finances as it needed to be in pre IPO days. Development felt it was supported but it did not seem to get visibility up through the organization when it came to making tough investment decisions. The development vision seemed to start in the middle of the organization, spawning out of ideas at the regional VP level. This is a perfect example of ‘emergent strategy’ as described in chapter one and represented in Figure 3.

The Enerdeq development project seemed to stumble in 2004 and 2005 due to lack of proper funding as the company cut back heavily on expenses in order to get ready to go public. There were two or three changes of software development leadership, each which created its own set of goals, but no unifying vision emerged.

In August 2006, things suddenly began to look more positive again. The early customer revenue from the newly released Enerdeq demonstrated success and attracted interest of the company

executives. With this new found visibility the development of Enerdeq became the #1 development priority for IHS Energy and project funding has increased significantly. Given this change and the arrival of the new CEO Stead, people feel things are definitely heading in the right direction. However, some consider that twice as much funding and resources are required to get the complete replacement product launched because there isn't much time left as the older products are being barely kept alive. This is looked at again later when considering the transition strategy in Chapter 7.

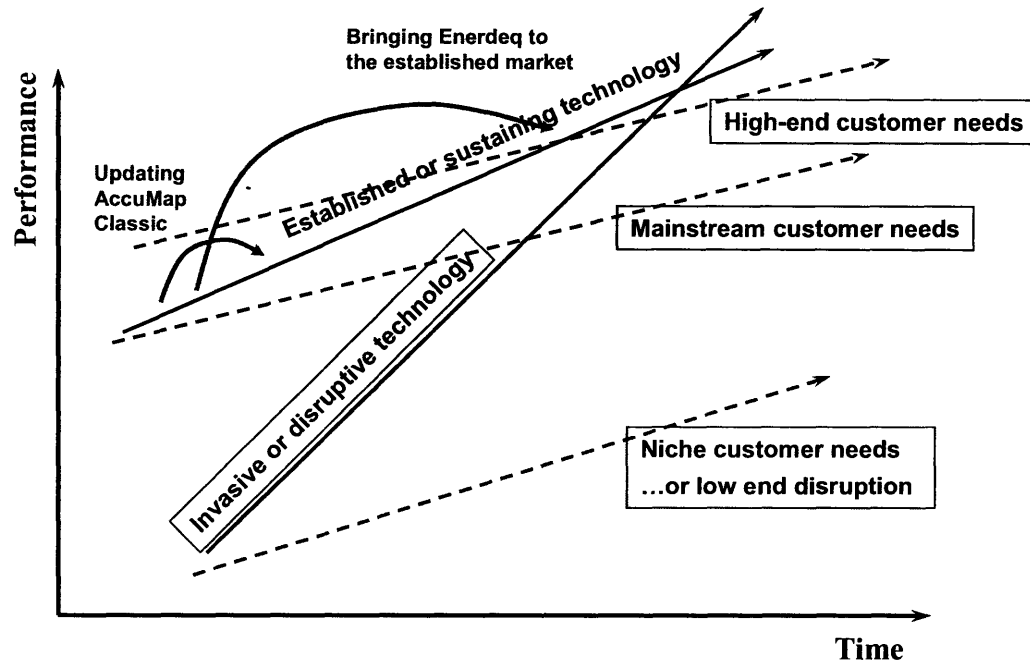
4.2 THE TECHNICAL ADAPTATIONS

The need for integrating AccuMap and Enerdeq arose because there were multiple disparate platforms that essentially did the same things. When the idea of Enerdeq was born in 2004 there was a global vision around what this new product could be, the global replacement for Probe and AccuMap and a wonderful cohesive unified energy product platform, the best of everything. The vision for Enerdeq was that it would enable the following integrations of products and services in addition to maintaining the traditional functionality of AccuMap and ProbE™ desktop products.

- Enerdeq Desktop: Integration of proprietary data, (Geographic Information Systems (GIS) data, and relational data), live access to IHS Energy's data hosting center
- Enerdeq Web Services: Integration of proprietary data into internal systems and 3rd party applications
- Enerdeq ArcMap Extensions (i.e. extending data access to ESRI ArcMap® tools): live access to most recent data, Integration (of data).
- Enerdeq Web Browser: Live access to most recent IHS Energy data
- More feature rich online capability than current product offering

Although it is not seen as a disruptive technology this is seen as a major transition which will bring about discontinuity in performance for a period of time (see the S-Curve in Figure 2). This disruption allows IHS Energy to better serve its mainstream and high end customers and gain greater market penetration. Figure 4.1 represents this change showing the eventual expected jump in Enerdeq performance, using a modification of Clayton Christenson's classic model taken from 'The Innovator Dilemma' .

The Innovator's Dilemma: "Sustaining" versus "Disruptive" technologies



Clayton M. Christensen's "*The Innovator's Dilemma*"

Figure 4.1

The creation of the Enerdeq vision was strong. It was well understood among the middle management of the company, but arguable not as well understood at the executive and CEO level. In August 2006 the company began to put more strategic weight behind it, by naming Enerdeq the No.1 strategic priority for 2007. However, the development and product integration efforts struggled in the two to three years prior to the creation of this global vision. There is still a lot of integration work to do to achieve this vision.

According to one senior member of management, the large number of adaptations required for the integration can be broken down in terms of "people, process and technology". There were pretty big changes on all three dimensions, but the people and cultural side of the integration was by far the most difficult piece. All those interviewed agreed.

We will start by having a look at the adaptations required in technology and process areas.

It was a complete technology shift to move from where AccuMap had been, develop the next generation of AccuMap and align it to the rest of organization. When work had started, prior to Enerdeq, on the next generation of the AccuMap product, it began on a Java platform. Later as the AccuMap team looked at where the market was heading and saw some of the technical limitations, the decision was made to move away from Java and go to a .NET platform.

When the development teams from Denver joined in they basically joined part of that technology platform spearheaded in Calgary. The development team in Calgary was focused on one aspect of product, .NET development for the desktop applications and the Denver team was primarily focused

on Java for some of the web based version. Merging from overall team perspective was less of an issue, because the teams were structured in location where they were still using their processes and their technologies.

One senior manager in Denver was tasked to take a look at what was needed in the form of core architecture to bring all these pieces together. During the interviews he recalls “In doing that I found extreme cultural differences between Canada, U.S. and the U.K. It was sort of astonishing. I didn’t think they’d be quite as big as they were. Another thing you find is a lot of pride in ownership. When you’ve been successful with different product offerings you tend to gravitate towards those processes and those technologies as being the best. You get a whole lot of discussion when you start going across those (regional) alliances to which is the best way of approaching a particular challenge. We had to learn a lot about each other over the course of three to four months to be able to get to the point where we could form a consensus on what our strategy was going to be. When you’ve got three different very distinctive cultures having that discussion we had some pretty lively debates.”

In 2004 the technology decision related to the desktop was a relatively straight forward decision. It had already been made by the AccuMap team, having looked at a couple of different options. In that case everyone in the combined development team was okay with going down the Microsoft .NET route. Initially the separate teams co-ordinated on different aspects of the same product but they were primarily independent, with overlap taking place at the level of the architecture team. Later integration between the teams increased, but full integration was never achieved.

One of the commonly understood goals with respect to technology development was the ability to have developers move fluidly between products, new or old, where necessary by having common platform and development tools and processes. This meant that functional teams (e.g. QA, development, core architecture, interface design, product planning) were set up instead of product teams. The goal was to spread the knowledge more effectively throughout the organization and help ultimately bring consistency to the products from a user perspective. All products could integrate with each other easier – like a product suite.

Today IHS is working to further reduce its infrastructure footprint by using common components and following a service oriented architecture approach in order to realize significant cost saving. The decision was made to take the next great step and standardize the technology across not only IHS Energy but IHS Engineering also. The company has shifted the technology mix and IHS is moving everything to a common windows technology stack.

There is a leap frog effect going on. Initially the Enerdeq group had decided to have a mix of Windows on the desktop side and a JAVA oracle mix on the server side. Now two to three years on, with the current version of Enerdeq the development group is trying to coalesce all of their technology so that it is just .NET across the board. The group is dealing with some of those technology and process merging issues still today and it hasn’t been fully integrated yet. Long term this common platform and common set of tools will be an acceleration point. As more content is added the development team will be able to react more quickly and integrate the content into other products much faster.

Most people agreed that the design of applications is considered a core competency within IHS energy. Opinions differ on whether that application needs to be developed in-house or not. Some executives believe that you need to understand what you are doing and be closely connected to your customer in order to develop market leading software. Others believe that it doesn’t matter if you are developing an oil and gas application or some warehouse management package it can all be outsourced. In the past year and a half in particular there is an increasing move towards an outsourcing strategy and this evolution has resulted in the loss of a number of key people.

With regard to process adaptations AccuMap had a very well defined developed process, which allowed a high number of incremental changes to be released with the latest data on monthly basis. The integration was a massive development project on a much greater scale and totally different processes were required to set that up. According to one senior developer leading the integration of

development groups means building “a deep understanding of processes and technologies used by both development groups, with the goal of learning from each group”. Merging of process or technology should be considered, but alignment should only take place where it makes sense. “Try not to merge or share just for the sake of it, it must benefit the customer in some way.”

Given the strong process mindset sorting out the new processes apparently worked pretty well. A strong team was pulled together although a number of those people have recently left the company. The first two major releases are out and it’s been done without really losing any market share. Some however, feel that the conflicts between local and global needs still exist and there has been no leadership, (or processes) to help this resource shortage driven dilemma.

4.3 THE TRANSITION STRATEGY FROM OLD TO NEW

While some felt that the general development transition strategy, in terms of maintaining the old and developing the new was achieved reasonably well, others felt that the investment in development fell short of what was needed for the integration. According to one interviewee, “The danger or challenge is if you don’t pay attention to the old product, some competitor comes and kills you before you get the new product out.” This matter still requires attention today.

One manager believed that a major integration success was finding the right person to drive the development of new integrated platform at the project management level. Bringing in an external person was seen by some to relive a lot of the early team tension because there was less interest in local politics.

Another perceived success was early customer engagement in a lot of the design work. When the first release of product came out, it was not intended to replicate what AccuMap had, but it had enough critical features for some clients to begin subscribing to it. The same is true of subsequent releases. Despite these indications of early success, some believe that product performance fall far short of expectations and this is exacerbated by instability problems and slow installs. Others feel strongly that customers need to be engaged and consulted even more frequently than the current development cycle allows for, which is approximately every couple of months.

During this time of transition, some managers were asked to step up to the plate and manage at levels they hadn’t managed at before. For most there was no initial mentoring or training or even awareness of what was needed in this new context. Some managers felt completely out of their depth, taking what they had learned along the way in a small organization and suddenly trying to apply it in a larger group. Rewards and recognition primarily stayed the same, but the informal recognition changed as people began to report to remote managers who had less interest in local perspectives.

Success gave people an outward confidence. When they were placed in management or other new roles for which they did not have the skills at the time, their confidence and strong relationships helped them survive. Overtime the mismatch in expectations between them and their new bosses created a strain. This strain meant that some groups were at times working in totally different directions without anyone being held accountable for aligning their focus. With the benefit of hindsight people saw that all people being promoted needed training and mentoring, regardless of their previous success. These managers or key contributors could then be held accountable for their progress. Despite these challenges or perhaps because of them the corporate group at IHS Inc. was seen to do a good job of creating career paths for staff. They made an attempt to create an alignment of cultures and some development goals were set.

A related challenge, according to some interviewees, was how to motivate the people maintaining the legacy products, including AccuMap, Probe, EGIS and PID-Plus so that they did not feel isolated or like second class citizens as their resources dwindled. Managers feel they needed to be ready to answer questions such as “What happens when the next generation comes? Do we all get fired?”

Addressing these questions and overcoming the lingering attitude of 'us versus them' continues to require attention today. These issues are revisited again in Chapter 7.

4.4 THE CULTURAL ADAPTATION

According to one of the interviewees when it comes to integration there are three interconnected factors to consider. "No.1 is leadership capability, effectiveness and styles. Change in leadership is an extra element which comes into play in this case. No.2 is cultural differences, acknowledgement and understanding of them and an effort to deal with them. No.3 is communication, which runs through both of the previous pieces. Even with those two challenges, if you have good communication you stand a better chance of fixing them. The communication isn't happening and they are all intertwined that creates even more barriers. Leadership and culture are the big ones and communication runs through them". In this person's view "these challenges weren't unexpected, they just weren't addressed and they remain major issues today".

According to a second interviewee "Most of the barriers were the challenges of trying to weave a reasonable political path through all the minefields" Management in the US office agree that the Canadian group does a very good job of articulating values and establishing a culture and it had turned into a very close knit organization. However, there was a general feeling of lack of appreciation for the values and culture that exist within the other groups, particularly Denver. Although they don't articulate their values or drive the culture openly, the managers believe that a culture does exist in the kind of people hired and in how those people are treated. In contrast Canada's culture is proudly displayed on the walls of the Calgary office for many years. It is well specified and has been updated with enthusiasm over the years. One US manager believes that specifying the values is something that needs to be done more in Denver.

One interviewee expressed concern that the values of dignity and respect, expressed within the Canadian group, were not always extended to the people the group was working with outside Canada. "That's where a lot of the clashes came from and a lot of bad feelings came out because of that. There is a real danger of groups becoming too insular and not appreciating that although some differences exist with other groups, that they are also effective." From the Denver perspective it also had a very good team which was very close and tight in working together. "It really took bringing the teams together and locking them away for a couple of weeks to solve problems together before the barriers came down. Some people never got over it and they ended up being moved out of the company. Some people don't like change. Some people just cannot ever deal with it."

The phrase 'command and control' was used repeatedly by almost everyone when referring to Denver management and leadership style. One senior member of management responded "Denver is all command and control and Cooper is command and control. When the merger took place I heard this a hundred times. The truth is a long way from that. It's never been my style."

One tactical goal that was put in place but was very difficult for the global IT team to achieve was to create and publish a common set of values. The goal was accomplished, but given the lack of integration that still exists today these common values did not take hold. Everyone agrees teams went into an 'us versus them' mode and there was lack of respect for the other teams. Denver was seen as big bad corporate and Canada considered itself an island. Most people see that the cultural differences are still there and still create tensions. Some see the differences in terms of life style choices, where people in the U.S. and U.K. offices are expected to consistently work 60-70 hours a week, whereas they are not prepared to set those expectations in Canada. Although managers accept that people burn-out and the attrition rate goes up even more with that expectation, it is seen as the preferred working model.

The cultures were also different in terms of incentives. In Denver profit sharing was not an established practice for everyone as it had been in Canada. In Denver people were motivated by personal career opportunities and the chance to learn new skills or processes. The development groups formed to take the product to the next level were motivated in those terms, rather than by

company profit sharing. According to one interviewee “When people got to chart a path and had a stake in which way we were going to go, rather than being thrown a set of spec and say here develop this, they were motivated. When the groups began to integrate some developers still wanted to be associated with a particular product and not just an organization. Some lost interest when assigned to a functional group or when multitasking on different products and projects. If it didn’t fit with their career objective they would just move on”.

Some still see that the command and control approach may be the only way forward and believe that the current phase is more of a benevolent dictator phase. “As the company is going to standardize onto one platform therefore there is less room for discussion. There are so many more objectives to move onto a standard set of technology and core architecture that probably the only way it’s going to happen, is to force it.”

Side by side with this you had a Canadian company that’s been a market leader for over a decade where profit sharing was a powerful motivator and an established profit mechanism for everyone. The developers operated very well on their own, closely interfacing with their local customers. Now they are told to be a global company and respond to the directions from a remote functional group, and have no customer interaction. The company has lost quite a few key players because they could not embrace this change.

4.5 WHAT WOULD PEOPLE DO DIFFERENTLY WITH THE BENEFIT OF HINDSIGHT?

All people agreed that they would spend a lot more time on the team work aspects of integration and not just assume that it was going to happen. The regional barriers remained in place a lot longer than expected. Many believe that the remaining cultural issues still need to be acknowledged and reconciled before integration can be fully achieved. Most believed that understanding and anticipating what losses might take place in each group would have helped.

One interviewee expressed the strongly held belief that “It comes down to leadership, understanding how to integrate the different teams and cultures, creating the vision to follow and then getting the people to follow.” Most agree that it helps to explicitly state the values and work towards more open communication.

Engaging all of the stakeholders sooner, including sales and marketing, the content group, product managers and project managers, would have reduced some of the barriers and accelerated progress even if it dragged out the initial discussions.

While there were different views as to the importance of reward structures, such as profit sharing, most agreed that incentives needed to be aligned if the company was to shift towards a more global focus rather than a local or regional focus. Others felt that turnover was inevitable and mitigation plans were put in place, but they were not proactive enough to cover the loss of critical people, for example those with domain knowledge expertise who took a long time to replace.

Different elements of the former cultures are still floating around. Most people struggle to define what today’s integrated culture is. All opinions differ. Some see broken remnants of an old culture, others see a blended but undefined new culture where people work better together. Some appear confused, and others feel less empowered to influence. There is yet another new leader in Mike Neal with very direct style for the global IT services and systems team. People are adjusting once again. This is a perfect opportunity to give some attention to defining the culture. This matter is discussed again in Chapter 7.

4.6 SUMMARY

Below is a list of topics which interviewees believe still need to be addressed following the integration of product development resources into the global IT services and systems group. Many of these topics are further addressed in Chapter 7.

- Set unified direction for team by clearly defining goals and priorities.
- Address critical resource allocation problems
- Continue to engage customer closely (to identify value capture opportunities)
- Agree core competencies, (e.g. with respect to outsourcing strategy) so that career paths can be established and unnecessary staff turn-over avoided
- Ensure respect for each group culture, traditions and their espoused values by continually acknowledging what changes people are being asked to make, through clear and frequent communication.
- Keep what is best about old processes, recognizing the opportunities to enhance or discard them.

CHAPTER 5 – TRANSITION TO GLOBAL MATRIXED ORGANISATION

Here we examine the collective responses to research question No..5 which asks “What lessons has IHS Energy learned in moving from a regional business unit (BU) controlled software development function, to a global function controlled within a global matrix organization?”

In 2003 IHS Energy began restructuring into a matrixed organization with functionally control groups replacing the regional business units. HR and finance groups were among those that quickly became part of the respective global centralized functions. All software development functions and Information Services groups became part of the global information technology (IT) group. While many feel that this has allowed groups to learn from each other and create greater common goals or visions than could be created by one group, all those interviewed agree that it has not been a smooth transition. Many lessons have to be learned or re-learned as management at all levels continues to change.

The outline structure, described below, relates to a discussion on ‘Building Successful Organizations’, which was taken from a lecture on ‘Managing through Discontinuities’, April 10, 2007. This lecture was part of the MIT Sloan ‘Technology Strategy’ course (Course No. 15.912) taught by Professor Rebecca Henderson.

- **Lead:** Creating and communication a greater shared vision
Build a senior team, communicate the strategy and allocate resources
- **Structure:** The effects of the matrixed organization on the innovation cycle
Explore transitional and intermediate forms
Getting Worse Before Better (WBB)
- **Incent:** Align regional incentives with global strategies
Explain “Just what’s in this for me?”
- **Build:** Customer inputs to the innovation cycle
Lay the foundations for a new culture, new expectations

5.1 LEAD - CREATE AND COMMUNICATE A GREATER SHARED VISION

In the global IT development organization the management structure was aligned to help create a shared vision of a consolidated global product portfolio. According to a former AccuMap developer “The shared goal has expanded since 2003. There is even more consolidation than originally envisioned”. When the developers began to see the overlap, they realized how much of a difference they really could make if they shared product architecture. Certain architectural designs are now being adopted to allow products to be shared more easily.

People interviewed accepted that initially some regional groups had been a bit small minded and tended to look only at the regional market needs, where all their revenue and expertise lay. For example in Calgary the early vision for replacing AccuMap did not include a browser interface or on-line data access. Consolidating products was a long term goal, but not a priority given limited resources. The feedback back and forth helped to create a greater vision of replacing as many products as possible and eventually supporting a smaller technology footprint.

Developers got the go ahead to start working on the project without the full plans. Neither the leadership nor the infrastructure was seen as strong. People felt that the leadership was initially paying lip service, by asking managers to do things for which they did not have resources. As this great vision has evolved, people feel it has not been well communicated to the rank and file members of the global IT organization. Without proper communication the de-facto strategy, as discussed in chapter one and the use of resources cannot be fully aligned with this vision. Some infrastructure

alignment has occurred and there is increasing focus on this area. The Enerdeq desktop and browser share the same UI designs and the goal of sharing the same core architecture was initiated in late '06. Some people expressed concern about the effect this will have on the remaining entrepreneurial energy in the company and this issue is examined next in looking at the company's innovation cycle.

5.2 STRUCTURE - THE EFFECTS OF A MATRIXED ORGANIZATION ON THE INNOVATION CYCLE

Mike Neal, the new global IT group leader, is seen as very visionary and he shares the earlier vision of innovative product consolidation, code sharing architecture and common tools across all of IHS. There is some flexibility and some recognition of historic cultures in that groups don't have to change tools today. The perceived leadership style of "command and control" still dominates within the global IT management level according to those interviewed. Most agreed that dealing with demands of being micro-managed or controlled took from the time they have to guide and explain things to developers. This loss of momentum impacted innovation work and only served to underscore any cultural differences which still existed. This is a classic example of the tension that exists between innovation and operational groups. Figure 5.1 shows the complimentary strengths of both groups and highlights the need for consciously accepting that tension in order to create a successful merged organization. Successful global organizations require leaders who will openly and continually address this tension in order to meet the needs of both groups.

Embracing and Balancing Real Organizational Tensions

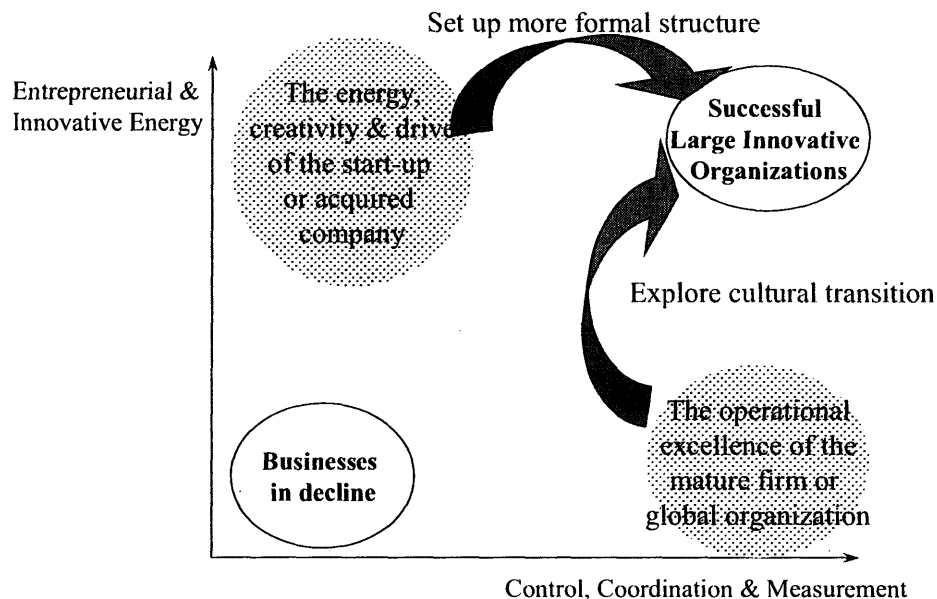


Figure 5.1

With the changes in leadership in IHS Energy many feel that the lessons learned in moving to the global matrixed organization are being re-learned again. The main lesson is that constant budgetary

constraints and meeting demanding management requests, continues to exacerbate the problems of lack of resources. This continuing cycle is eroding the company's ability to innovate which in turn impacts revenues. In system dynamic terms such a cycle is known as a negative reinforcing loop. This innovation cycle is shown in the 'system dynamics' diagram below using feedback processes to represent the dynamic nature of the cycle. Systems dynamics is field of study which allows complex and dynamic organizations or systems, to be described in terms of feedback processes and other structures which are then modeled using computer simulators. See Figure 5.2. The company's 'Innovation Erosion' loop is shown as a self reinforcing loop (R) which means the prevailing situation (whether good or bad) is strengthened.

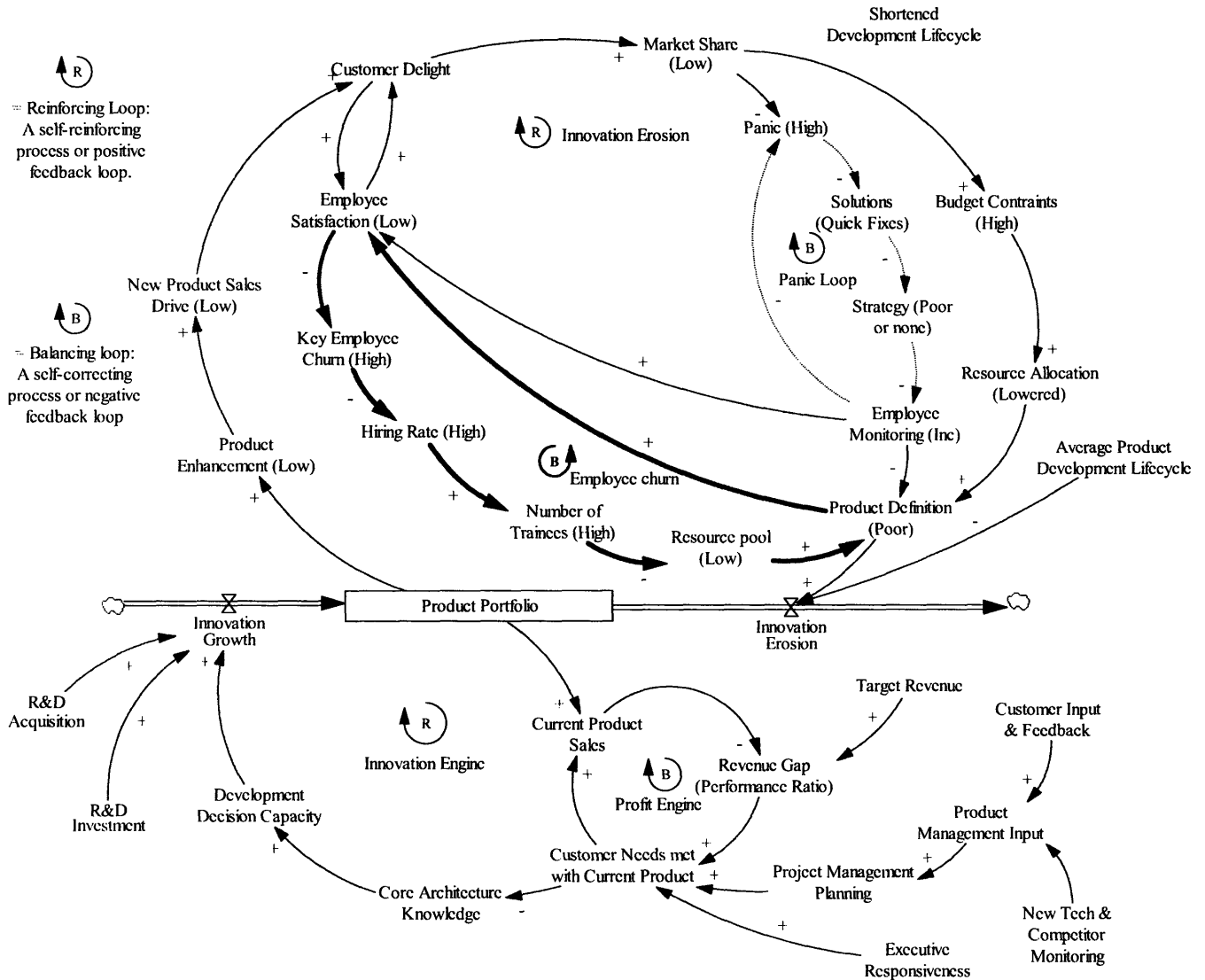


Figure 5.2

There are a number of ways to balance this negative loop, the main one being to apply more resources either internally in the development group, or external to the group or both. According to those interviewed to successfully launch the Enerdeq products resources are needed in three areas, core architecture knowledge, product management and sales, the latter two requiring more focus on new products. When looking at Figure 5.2 we see that these resources affect three major feedback loops, namely the 'Profit Engine', 'Innovation Engine', and 'Innovation Erosion' loops. Loss of

developers with core architecture knowledge for existing products is still a critical issue as it places additional pressure to retain market share by releasing new products early with quick fixes which must be addressed later. This further slows down the overall product replacement schedule. This forces people into the 'Panic Loop' as represented in Figure 5.2. In summary the lack of resources in any one of these critical areas means the innovation cycle is not balanced and cannot achieve its revenue targets.

When development resources are constantly constrained there is no time for skunk-works projects, creativity or playing with technology. The innovation cycle is totally reliant on external inputs for new ideas as the internal resources have no time to explore creative ideas. Even if the organization chooses to go to an outsourcing model for software development and data accumulation it needs a process to generate innovative ideas and manage the subsequent development. Most of the core interviewees agreed that the global organization needs to be more tightly integrated internally, regardless of the future innovation strategy.

5.3 GETTING WORSE BEFORE BETTER

One of the challenges in managing the trade-offs between short term profit and long term goals is the up front investment of time and resources required to achieve the long term goals. It is very difficult to accurately determine how long the effort will take and how large the investment will be. When moving to a global organization, the same up front investment is needed to reassess goals and reprioritize projects on a case by case basis. Regardless of the structure used the company will be in overload and the reality is that things will get worse before they get better. This phenomenon is known as 'Worse Before Better' (WBB) and is often overlooked or its effects underestimated when changing the structure of the organization.

In moving to a global matrix organization in IHS Energy things got 'Worse Before Better' and many groups in the company went into firefighting mode. Some groups such as HR and Finance went through the WBB phase more quickly than others, centralizing and standardizing tools and practices relatively quickly. The IT group, because of its less structured and innovative nature, was going to take longer. People disagreed as to which part of the innovation cycle needed attention. Some felt there was an overemphasis on achieving the schedule which leads to a tendency to "fix the problem in the next release". Others felt that there was no time for elegant discussions about how to get there as meeting the release schedule was the number one priority. Tension resulted and groups went into firefighting mode in order to meet release dates. Despite new resources the company was struggling to gear up for growth as this industry had been in a contracting cycle for over a decade. Decision making during this time was slow and inadequate according to those core interviewees. It was felt that even bad decisions were better than no decisions because they could make mistakes and recover, which actually aided the WBB process.

One of the biggest challenges in addressing WBB is deciding where to start fixing the problem. In order to get the innovation cycle running effectively, you have to address the whole dynamic system at once. In the case of the Global IT group this means addressing the company resource issues. The risk of not addressing this innovation or product development cycle is that they system could eventually tip into constant firefighting mode, which would permanently erode the innovation capability. Tipping point can be thought of as the productivity level above which the system becomes unstable, where the addition of any new development project or the further loss of resources would result in the company spiraling into reaction mode. Clearly it is a lot more expensive and more difficult for a development group to recover from such a position.

Given the excessive focus on bottom line growth in IHS Energy and the prolonged WBB situation that exists in the Global IT group due to lack of resources, there is still a risk that the organization could cross over the tipping point into continual firefighting mode. The use of project management for multi-site collaboration projects mitigates this risk as does articulating a clear strategy and aligning incentives with global goals.

5.4 INCENT: ALIGN REGIONAL INCENTIVES WITH GLOBAL STRATEGIES

In 2003 when developers within a region were carved up into global sub-teams they reported to managers outside their regional office. This was a new concept to most of them and many felt confused and isolated. The local management team was suddenly disconnected from the resources it had previously directed and supported in a very hands-on way. Some managers felt frustrated and disempowered as they were no longer able to influence the product development or the assignments of the developers. No-one wanted to own the regional development project as many people felt that it was being driven by the global group and not by the BU as it raised the question “Just what’s in this for me?”

Some managers felt their role was reduced to sitting on the sidelines giving verbal but no actionable support. To some others it appeared as though local managers were much more actively engaged than they were. During these interviews it became apparent that sometimes senior members of management believed someone else was looking after a critical activity when in effect no one was paying attention to it for months at a time. One example of this occurred during 2005 when there was no product management in Calgary for almost four months and no member of senior management pushing for an urgent resolution. This meant there was no customer input and minimal innovation during that time. Today, managers and developers have come to accept that the development resources are globally owned and there is wide appreciation of the need for project managers’ skills and product management empowerment to effectively handle multi-site collaborative development projects.

Today however, management teams are still incentivized based on local revenue and margin growth. This makes it still very difficult for the global functionally driven groups to roll out a global strategy or achieve long term goals as regional managers have their incentives aligned with the short term goals of the company. Developers could be assigned to working on joint development for building the overall architecture, which meant that they were not working on product for their local business unit and not impacting the bottom-line. This created a sense of conflict, in the Canadian office, for example where developers were being asked to work on tasks for the benefit of whole company, but these tasks would not impact Calgary profit share or their own salary. In such cases the line of sight to the overall corporate objectives is effectively lost and people don’t understand “Just what’s in this for me? All of the core interviewees agreed that incentives need to be better aligned with global strategies, if the model of having global functional matrixed units is to work properly.

5.5 BUILD: CUSTOMER INPUT TO THE INNOVATION CYCLE

When Jerre Stead took over as CEO in November 2006, he set about laying a foundation for a stronger company culture based on the fundamental principle which he has been articulating since day one. Stead laid out four primary objectives which are;

1. Customer delight
2. Colleague success
3. Profitable top and bottom line growth
4. Share-owner success

Since day one, his focus has set about creating a clear line of sight for everyone in the organization. All agree that this increased attention to the customer is welcome. However, it still has to be balanced with improving the bottom line growth. Regardless of concerns about how this will be done, Stead has managed to set new expectation for employees, customers and shareholders alike.

Most people agreed that there is not enough customer input into the innovation cycle, whether it is to product managers or to software development leaders involved in functional design. All agree that the matrix organization has greatly increased the complexity and challenge of understanding customer needs. The corporate directive of centralizing, globalization, standardization, and reducing cost to improve bottom line appears to be at constant odds with the need to look at and understand customer needs and respond in a highly innovative way. Developers are further from the customer in a functional global matrixed organization but arguably that is okay if they are closely linked to product managers. The structure of the matrixed organization itself, with regional or remote management, is not seen as an issue once people have easy daily access to the groups or individuals they need to talk to. For many Enerdeq developers, they are satisfied when they have access to product managers with good understanding of the customers' future needs or to development managers who can help them understand the big picture of the innovative environment.

According to core interviewees, capturing customer needs would not necessarily be more effective if left to the regional business units because of the regional tendency to focus on current product replacement. On the other hand some argued that the company is too focused on global needs over local strategy and the lack of resources there puts current revenue at risk. All people agree that momentum is still being lost as managers struggle to figure out the balance between local and global needs and the resource needs for old versus new products. The benefit of the matrixed organization under strong leadership is the ability to share knowledge and achieve greater integration and consolidation than could possibly be achieved in isolation. Strong and clear direction from global IT leadership is needed to remove the obstacles to capturing both the local and global customer needs.

5.6 LESSONS FROM LITERATURE

The main observations from the responses given to research question No.5 are summarized below.

- Moving to a global matrixed organization has helped to improve product consolidation and grow a larger vision for future product innovation according to some interviewees. Not everyone is yet convinced and they need to be, so they can buy-into and act on that vision.
- Excessive focus on bottom line growth makes it more difficult to move out of 'WBB' situation.
- Resource shortage is the single biggest contributing factor to 'Innovation Erosion' as described in system dynamic diagram 6.1
- Regional incentives need to be aligned with global strategies for managers and developers.
- The voice of the customer is being lost in this matrixed organization.

The observation that is most complex to deal with is the issue of moving through the period of 'Worse Before Better' which is prolonged by the excessive focus at IHS Inc. on bottom line growth. Some brief highlights from a pertinent HBS case study entitled 'Improving the Product Development Process at Kirkham Instruments Corporation' are included below. The case study raises challenging questions on the combination of leadership, measurement and process in a way that is highly relevant to the innovation challenges at IHS Inc. It also provides some insight into why companies remain in a 'Worse Before Better' situation for much longer than expected.

In the early 1990s the company, identified as Kirkham Instruments, decided to centralize new product development decisions because customers wanted to link products into integrated systems. This meant that the next generation products would require a lot of coordinated design and development. The company faced a number of challenges. Firstly, the number of products being

developed needed to be cut as the company did not have the innovation capability to meet its current projects commitments. Secondly, the company needed to distinguish between major breakthrough development projects and incremental development work. Thirdly, the company had to come up with an effective way of killing projects which did not fit its strategy.

The CEO was clearly committed to and passionate about making the necessary changes. Independent experts were brought in. A comprehensive change strategy was created. New employee training and project monitoring was put in place. All aspects of the changes were considered. Despite the investment and commitment, the outcome showed little effective change. The number of projects remained about the same and bureaucracy of getting projects through had increased rather than decreased.

The company was not prepared for a prolonged situation where things would need to get 'Worse Before Better.' If the company was actually going to cut projects there would be an initial impact on the company revenues. So the revenue growth problem it was seeking to address in making these changes would get worse before it got better. If the company wanted to embrace the challenge of creating products which are linked via integrated systems, then significant new platform development was needed. Building the organizational structures and skills required to accommodate all the necessary cross-functional activities would be a costly and time consuming undertaking which would further impact revenues. The company would have to allow profitability to take a hit in the short term and it was not clear that the company had enough data to understand the implications of making a real commitment to improving its innovative capability.

Kirkham Instruments is representative of many companies who find themselves in this situation. It is worth highlighting that all observations made above contribute in some way to prolonging the WBB situation. In the global matrixed organization it is important to consider addressing all these issues at the same time in as far as is possible.

CHAPTER 6 – WHAT ARE THE CURRENT BARRIERS TO INNOVATION?

Here we consider the organization structure and use the Organizational Congruence Model when reviewing responses to research question No.6 “What are the current barriers to innovation?”

In previous chapters we have discussed many of the challenges that IHS Energy and the former AccuMap Company have overcome with regard to innovation and we acknowledge that many challenges still exist today. Now we look at how the factors combine to create a set of barriers to innovation within today’s matrixed global IT organization. We use a modified version of the Organizational Congruence model, shown in Figure 6.1. This version of the model formed part of class discussions during the MIT Sloan course, No. 15.388 ‘Designing and Leading the Innovative Organization’ Spring 2007, with Professor Diane Burton.

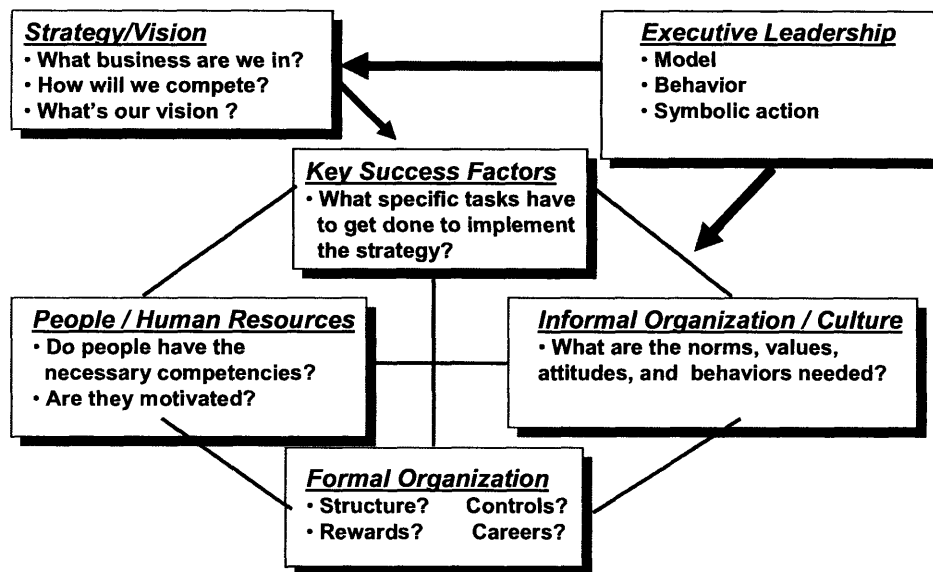
We divided the organizational structure into four building blocks listed below. We examine how well these elements are aligned to each other, and in particular, how well they support achieving the critical tasks.

1. Key Success Factors or Critical Tasks
2. Culture or Informal Organization
3. Formal Organization
4. Human Resources or People

Two factors which exert considerable influence over the organizational structure are the executive leadership and the company strategy and these are also considered. The critical tasks are aligned to the de-facto company strategy, the strategy which the company is striving to implement day to day (see Figure 1.3 in Chapter 1).

By grouping the issues raised in previous chapters into the four component building blocks and tying them into the company’s strategy and leadership approach we gain additional insight into what challenges exist from an organizational perspective.

Organizational Alignment – The Congruence Model



Ref "Winning through Innovation" M. Tushman & C. O'Reilly III,

Figure 6.1

6.1 CRITICAL TASKS OR KEY SUCCESS FACTORS

We start by looking at the critical task, for IHS Energy and the Global IT services and systems group, with regard to development of new products. We see how well the rest of the organization is aligned to successfully achieve these tasks and how integrated and aligned these tasks are with the overriding company strategy. From the interviews it appears that the commonly understood goal of the global IT group was to protect and grow the existing product revenue stream. Given this goal and the challenges identified by the interviewees the critical task, listed below, were derived.

1. Maintain efficient and cost effective product development process
2. Increase Value Capture (of the customers business)
3. Communicate big picture goals to all stakeholders

These tasks are essential for IHS Energy to succeed in achieving its strategic goal of creating a unified energy product platform, Enerdeq, as the global replacement for the existing product suite. From the interviews it was clear that people would prioritize these tasks differently and some would focus on only one of these tasks, namely to maintain a cost effective product development process. The problem with the singular focus on this task is that it assumes that IHS Energy's historical collection of production data (or content) will continue to ensure its market leadership going forward. Today competitors cannot buy this data from any single source and pre-1970 data is very expensive. However, if the customer decided that it didn't need pre-1970 data the barrier to entry for competitors would immediately drop.

Some also point to the fact that IHS Energy has promised customers replacement products since 2003 and the company is losing credibility by not delivering on this promise. Given the subscription

based selling, it is not immediately obvious what impact these delays are having on the customer's buying patterns as they do not emerge for a few years. Most of core group of interviewees, as identified in Chapter 1, agreed that IHS Energy has to increase its value capture, and get deeper into the customer base in selected segments. However, there was little consensus on how this should be done, how it could be funded and whose role it should be.

From this analysis it is clear that communicating the big picture becomes increasingly important so that everyone is moving in the same direction with the same top priorities. Figure 6.2 below shows a summary of the organizational alignment for IHS Energy as interpreted from the research interviews conducted for this thesis.

6.2 CULTURE OR INFORMAL ORGANIZATION

MIT Sloan Professor, Edgar Schein, is a recognized leading authority on organizational psychology. In his writings on 'The Role of the Founder in Creating Organizational Culture' he states that "Organizational culture is the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation and internal integration."

Thus the culture of the organization emerges as the people within the group learn to solve problems together. Given that the IHS Energy Global IT group was integrated in 2003 to address some common IT goals we look at what culture prevails or has evolved in terms of norms, values, attitudes, and behaviors and whether these help the company achieve its critical tasks.

The management style norms, as expressed in the interviews, were of command and control, and micromanaging in order to achieve cost cutting targets. Given that the oil and gas industry was in a contracting mode for over a decade, developers in the U.S. and U.K. offices were used to operating in an environment of cost cuts and constant understaffing. Any decisions made were final. In contrast the management style norms in Canada were of open transparent communication and accessibility. The developers in the Canadian office were used to being part of a small growing successful organization enjoying the benefits of profit sharing. Any decisions made were open to debate and challenge, particularly when it came to technology decisions which, according to one interviewee, were usually best kept out of the hands of managers.

Today, when it comes to maintain an efficient and cost effective product development process, the established group norms for dealing with problems are very different. Developers coming from a contracting business environment will seek to cut cost rather than invest in creating higher value. Developers who come from an expanding business environment will want to look for solutions by dabbling in skunk-works and playing with new leading technologies.

In order to reconcile these differences, developers in the new global IT organization and other key stakeholders such as product managers and project managers need to be empowered to make decisions, so that all those involved across the entire product development lifecycle can learn from solving problems together, instead of waiting for someone to decree the solution. A global matrixed organization is strengthened when those with responsibility are also given the authority or empowerment to make decisions.

The values embraced by IHS Energy in Canada were established many years ago and these were modified in recent years by a cross functional group of employees. They are proudly displayed on large wall posters throughout the company. These six values are Integrity, Excellence, Teamwork, Fun, Customers and Communication. These values encourage risk taking and exploring and generate excitement within the development community by maintaining focus on the longer term goals of the organization. The values of IHS Inc. are captured in the four primary objectives stated by Stead, the new CEO. These are - Customer Delight, Colleague Success, Profitable Top and Bottom Line Growth and Share-owner Success. The values focus more on short term needs of a public company, while

expanding this focus to include longer term customer delight. This reflects the mix of the two cultures which are now integrated in the global IT group.

When it comes to achieving the critical product development tasks this tension between the short term and long term goals translates into tension between immediate low cost solutions and long term cost effective solutions. This relates back to the innovation erosion loop within the product development cycle (see Chapter 5, Figure 5.2) where resource shortage is the critical issue arising from excessive focus on cost cutting or bottom line growth.

The critical task of increasing value capture by analyzing customer data is needed to grow the top line. However, this cannot be achieved without realigning resource and tightly integrating all the stakeholders who link the customers to the developers.

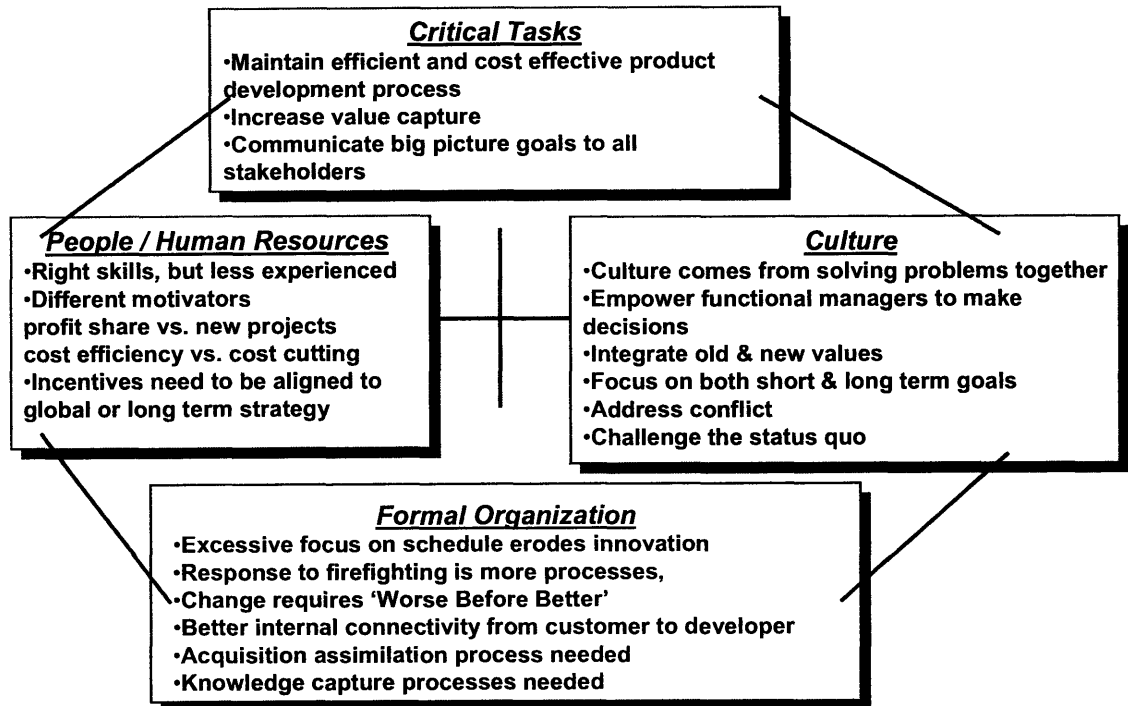
Based on the interviews conducted it is felt that the attitude of 'us versus them' still prevails today, though to a lesser extent than in 2003. There is still a sense of 'uniting against the enemy' when it comes to perceptions of micromanaging and increasing bureaucratic demands. This begs the question 'Who benefits from making the other side the enemy?' In a way the beneficiary is the strengthening of the local culture in Canada which has had both a positive and negative effect. The other attitude that prevails is that 'The tail can't wag the dog.' This sums up why it is difficult for the large acquiring company to embrace and learn from the successes of the acquired company, for example leveraging some of the Canadian knowledge on how to assimilate acquisitions. Another very strongly held view is that 'content is king - so the competition can't catch us'. Given these three fairly strongly held attitudes it makes the final critical task even more important. Clearly communicating the big picture goals to all stakeholders is essential to break through isolating attitudes and have everyone moving in the same direction

One behavioral norm discussed repeatedly during the interviews was the willingness to challenge the status quo. This is considered, by some, as an important behavioral norm which stimulates innovation through constantly testing ideas. Others consider this a luxury, which has no place in development projects. As one interviewee put it "With command and control, you don't have time for elegant discussions on how we are going to get there – schedule is priority"

If this behavior of challenging the status quo is not accompanied by respect for the company and all its employees, or if it is allowed to go unchecked, it can lead to strong resistance to change and ultimately conflict. While lack of respect is an issue, conflict in itself is not a problem. Conflict is a clear indicator that there are strongly held opposing views which need to be reconciled in terms of the work that the group or individual is doing. According to the core interviewees, there is no agreed method for dealing with conflict within IHS Energy and there was a sense that it was not necessary. However, if an underlying conflict goes unaddressed it creates a definite barrier to innovation. In chapter 7 we discuss in more detail how a culture of high conflict and high respect can actually benefit the innovative organization.

Organizational Alignment

IHS Energy & The Global IT Group



Ref "Winning through Innovation" M. Tushman & C. O'Reilly III,

Figure 6.2

6.3 FORMAL ORGANIZATION

The global IT group is continually challenged to find shared solutions to reducing the product development lifecycle and release new products more and more quickly. Formal project management practices are then set up to achieve this. The risks associated with this excessive focusing on schedule is that early stage development work gets squeezed out and late stage firefighting becomes more common in order to meet approaching deadlines. When this is practiced over time a firefighting culture develops, where quick fix solutions become acceptable with the intention of addressing the problem in later releases. People start to take this approach for granted as firefighting heroes are rewarded and early stage work becomes less and less valued. According to Schein "The model of organizational culture that then emerges is one of shared solutions to problems which work well enough to begin to be taken for granted – to the point where they drop out of awareness, become unconscious assumptions, and are taught to new members as a reality and as the correct way to view things."

A number of the interviewees acknowledged that firefighting and finding quick fix was becoming increasingly common and new hires are getting used to this as the norm. This could be partly addressed in the hiring process, by hiring experienced developers, for example with high domain expertise. Management is apparently attempting to fix the firefighting approach by putting more formal processes in place. This increase in monitoring can contribute to the 'panic loop' in the innovation erosion cycle which was described initially in chapter 5. See Figure 6.3. From an organizational congruency perspective setting up the formal processes with schedule as the top priority can erode the company's ability to achieve its main critical task of maintaining efficient and cost effective product development processes. One way to address this is to significantly cut the

number of projects in the loop and the other way is to add resources. Regardless of which solution is chosen, applying any change to the system will result in a 'Worse Before Better' period as described in Chapter 5.

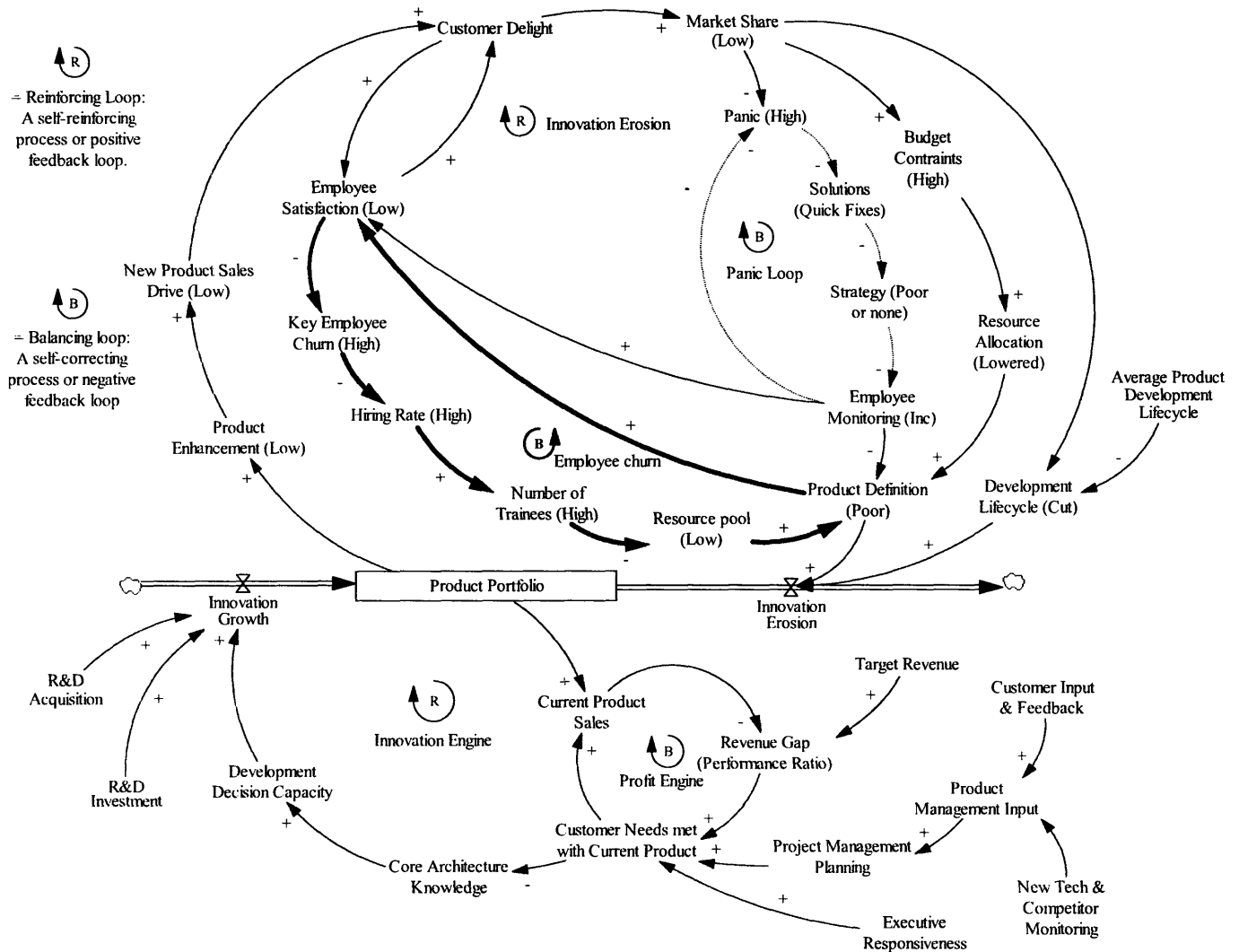


Figure 6.3

All core interviewees referred to the organizational changes in the global IT group which have taken place in the last six months under the new leadership of Mike Neal. While many see his leadership as visionary, as discussed in previous chapters, many people expressed concern that “the dialog between product managers, developers and customers is de-emphasized” with the new structure. This concern was expressed in a number of different ways. “The new philosophy is that product managers just tell developers what they want and developers go away and build it”. Another interviewee expressed concern that the gap between the business development or product management role and software development role was widening. “The innovation factor comes from both customer desires in response to market situations and our own smart people coming up with ideas. We need to get internal connectivity more tightly integrated”. This is seen as essential in order to implement key customer requirements and deliver according to promises made to customers. Interviewees also expressed concern that the formal structure does not link development to the sales and marketing teams to help them understand the new products so they will begin aggressively promoting and selling them.

Within the new structure product managers are now focused on one or two products in all regions rather than eight to ten products. This change in formal approach to product management was welcomed by those interviewed. Some of the core interviewees believe that this product management needs more skills in managing new products as distinct from well established products and that this needs to be connected to the hiring processes.

Another concern related to the formal organization was the absence of a knowledge capture process. This is important not just within the global IT group with loss of domain expertise, but in this oil and gas service industry in general, where data collection and capture processes are done by individuals scattered across the organization without any defined processes. Having formal knowledge capture processes would minimize the risk of losing key stakeholders in the development lifecycle. It would also help to capture lessons learned from the transition to the global matrixed organization, so people don't perceive that the same lessons are being relearned under successive management.

6.4 HUMAN RESOURCES OR PEOPLE

Despite the strong values based management style of IHS Energy Canada and the well acknowledged and well established culture which employees enjoy many of the former AccuMap and QC Data employees have left the company in recent years, particularly from the development group. The emphasis on cost cutting has made it increasingly difficult to retain the top people. The senior developers who recently left IHS Energy Canada did not wish to become 'code monkeys' where the excessive focus on the product development schedule meant there was no time for exploring or creativity. This same emphasis on cost cutting means that replacements hires cost less and are more junior. While people hired in both US and in Canada have the necessary competencies, they lack the many benefits that come with years of experience.

There are real differences between what is seen as motivation, within the U.S. or U.K. development teams and the Canadian team. According to core interviewees developers in the U.S. and U.K. are primarily motivated by the prospect of their product being deployed worldwide across a wide customer base. They are also motivated on more short term basis by the opportunity to work on new projects or with new technologies. They believe that cost cutting keeps them in business so they are motivated to cut costs with a view to having further projects to work on in the future.

Profit sharing exists in IHS Energy Canada, as a continuing part of company practice. The Canadian employees interviewed referred to the profit sharing as an ongoing motivator, but it is closely connected with a desire to understand and satisfy customers because increase in customer sales means higher profit sharing. In sharp contract developers in IHS Energy are motivated by cost efficiency and not by cost cutting. They see the latter as eroding their ability to explore new options and take risks so that they can create more highly innovative leading products. Profit sharing promotes more long term company loyalty, but according to core interviewees, the attractiveness of profit share has been offset by the continued restrictions on way they work and the lack of understanding of the big picture goals with respect to product development.

Given that the right skills exist but are constantly being eroded, communicating the big picture goals and establishing incentives which are aligned to the global goals or long term strategies, would help align this piece of the organizational model.

6.5 STRATEGY

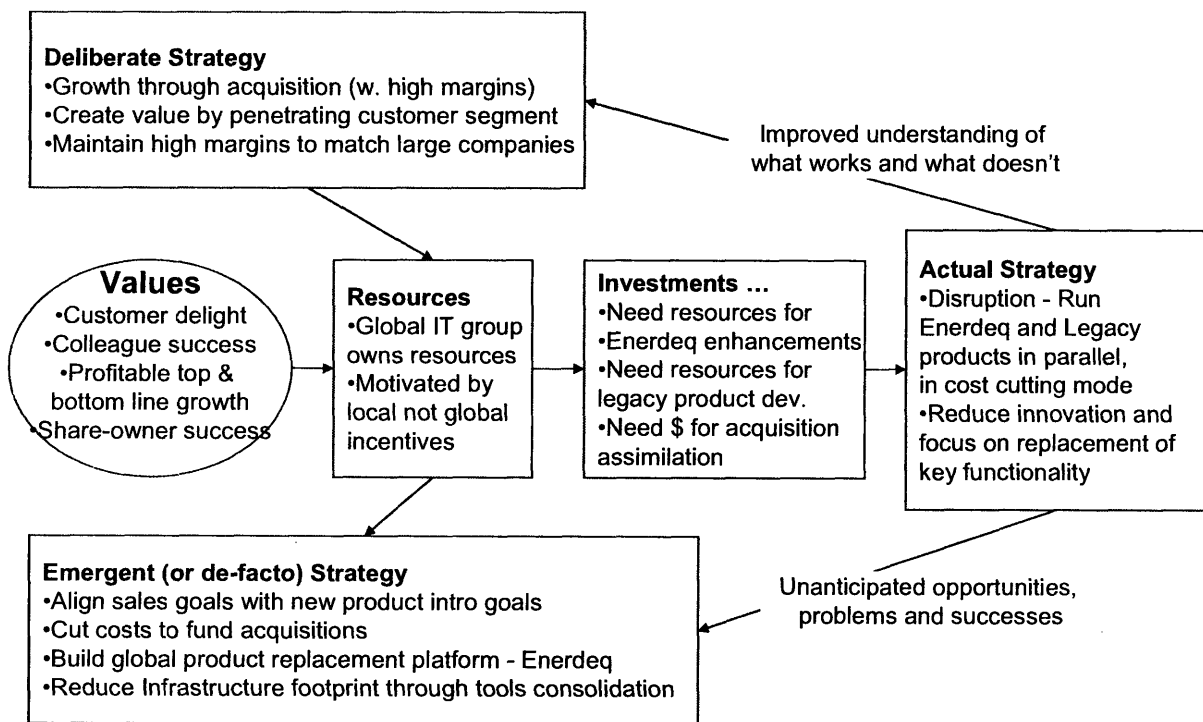
Throughout the interviews people repeatedly expressed a desire to understand the big picture goals more clearly. Many sought to understand how their work fitted in with the company strategy and future direction. In Chapter 1, Figure 3 we showed Christensen's approach to managing the

strategy development process taken from 'The Innovator's Solution'. Here we use that same model to represent IHS Energy's strategy today. See Figure 6.4.

This summary of the company strategy was derived solely from responses to the interview questions. It shows the company's actual strategy, which is made up of what the company intended to do, its 'deliberate strategy', as well as what just happened which is the unintended or 'emergent strategy'. According to one interviewee, "IHS isn't a great funder of R&D. I don't ever expect it to be. But certainly we will get companies that have innovation that fit in our industry that may be very complimentary to the organization and grow a lot faster." Another interviewee stated "I don't think Enerdeq is innovative. We never really intended it." A third interviewee expressed concern that "we have adapted the strategy in terms of Enerdeq goals, the issue is that we have not consistently executed on it. We were looking at how customers wanted to integrate different deployment types in all the regions." The concern is that as a result of focusing only on replacement certain deployments have been pigeon-holed in certain regions and other opportunities are being missed.

When it came to a question of whether Enerdeq was an innovative product or simply a replacement product platform one interviewee responded, "We will supply enough functionality to where we don't lose our customers. We are the market leader and we don't want to give customers up to the competition. There are certain expectations. (We will) offer a product that improves work flow and offers key functionality that (previous products) did have. You don't have to replace everything." Since this is considered a replacement product many believe that the company is left vulnerable while customers are changing from legacy products to the new product platform.

IHS Energy – Deliberate and Emergent Strategies



From Clayton M. Christensen, 'The Innovator's Dilemma' -Managing the Strategy Development Process

Figure 6.4

An overview of the above strategy was discussed with Clayton Christensen during the course of this research. He considered the situation of a company having a deliberate strategy to focus on acquisitions to maintain high profit margins, rather than to increase innovation. Christensen responded “Generally in a situation like that, the actually strategy comes in right to left, (referring to Figure 6.4). People get ideas for projects and those ideas then populate the matrix and you try to develop the capacity to do it and that then defines what the strategy actually is. The management thinks they are in charge but they really are not. You can kind of impute when you see what comes out, what the resource allocation process is, what can get through the gate and what can’t get through the gate” He further quoted Andy Grove as he does in *The Innovator’s Solution*. “To understand companies’ actual strategies, pay attention to what they do, rather than what they say.”

In his HBS case study entitled ‘Using Aggregate Project Planning to Link Strategy, Innovation, and the Resource Allocation Process’, Christensen describes this process in greater detail. The strategy making process generally flows from right to left when a market is emerging or undergoing radical change. According to the case study “when the deliberate strategy processes need to predominate, however, the strategy-making process needs to begin to flow from left to right. It must begin with a clearly articulated, broadly understood strategy.”

In the past six months it appears that a more deliberate strategy processes has been established within the global IT group. Yet almost all interviewees expressed a strong desire to have more clarity regarding the strategy and related big picture goals. In my view, articulating and communicating the strategy cannot be overemphasized at this time.

6.6 EXECUTIVE LEADERSHIP STYLE

Chapter 3 we discussed in great detail responses to the research question “How do leadership styles and values impact a company’s ability to create radically innovative products?” This question ties in well with the question to be asked using the organizational congruence model, “How well does the executive leadership style support achieving the critical tasks?” The following list summarizes, in no particular order, what interviewees considered to be the most important leadership styles and values, which impact a company’s ability to create radically innovative products. This relates closely to the critical task of maintain an efficient and cost effective product development process.

- Set and articulate a clear vision
- Align incentives to top objectives
- Guide functional management in aligning short term cost controls and long term strategy
- Set up monitoring with flexibility
- Communicate frequently and openly
- Empower employees
- Ensure high level of responsiveness to customer and competition

The critical task of increasing value capture would be supported by the desired leadership style of guiding functional management in aligning short term cost controls and long term strategy.

According to one interviewee “Stead is making sure everyone understands the vision and goals of the company so that there isn’t separation and it flows all the way down. He is trying to embed practices and put measurement systems in place to support this.” This style is strongly supportive of achieving the third critical task of communicating the big picture goals to all stakeholder and most believe that his style will gradually influence all management levels as early signs suggest.

6.7 SUMMARY

Barriers to innovation can be addressed by aligning the organizational structure to ensure critical tasks can be achieved. The issues that need to be addressed are listed below the related critical tasks which were derived as part of this research.

Maintain an efficient and cost effective product development process

- Reduce product development lifecycle
- Implement key customer requirements and deliver per promise to customer
- Ramp up critical hiring and replacement
- Engage sales and marketing in selling the new product
- Reduce number of projects being undertaken.(Worse Before Better)
- Set up monitoring with flexibility
- Empower employees
- Consider creating informal skunk-work projects or other forms of think-tanks

Increase Value Capture (from your customers business)

- Gather and analyze data on customer's value proposition
- Identify needs or opportunity for aggressive innovation
- Guide functional management in aligning short term cost controls and long term strategy
- Ensure high level of responsiveness to customer and competition

Communicate big picture goals to all stakeholders

- Set and articulate a clear vision
- Create line-of-sight view to company vision and goals
- Communicate frequently and openly
- Align incentives to goals (global as well as long term)
- Have everyone move in the same direction

CHAPTER 7 – DOES THE LEGACY OF SUCCESS AND MARKET DOMINANCE HELP OR HINDER FURTHER INNOVATIVE SUCCESS?

Responses to questions about the legacy of success can be subjective. However, there was a general sense of agreement among the original AccuMap developers and others on some of the common issues. The main observation is that success comes from the collective skills used to address a particular problem or industry challenge. Future success means being able to use those skills, or a modified version of those skills to address a different problem or adapt to a different social situation. Failure comes from not paying adequate attention to what those skills are and how they need to be harnessed in the new environment.

Below we look at examples of where skills, which contribute to innovation, were transferred over effectively to new tasks or similar tasks in a new environment. In each situation there are still gaps between the skills needed and the adaptations that have been made to address these needs.

- Assimilating acquisitions well
- Promoting an outsourcing attitude among developers
- Optimizing the use of the underlying architecture
- Aligning processes and tools based on needs
- Creating an urgent need for innovation as competitors catch-up
- Addressing cultural differences allows more focus on innovation

7.1 ASSIMILATING ACQUISITIONS WELL

IHS Inc. has made the acquisition of companies a key part of its growth strategy. One interviewee explained that the company is trying to mould the organization to be able to assimilate these acquisitions quicker than they have done in the past. US managers acknowledged that IHS Energy Canada has done a remarkable job of integrating their acquisitions. These acquisitions have been mostly content based and have been with companies that IHS Energy Canada has an existing proven relationship or partnership. However, their skill in leveraging these strong data vendor relationships means the group has established some due diligence norms, formal or informal, which allow it to complete successful acquisitions. This is a perfect example of where early success can help the company continue to innovate, though effectively acquiring and assimilation the organizations which it determines to be essential to its produce development strategy.

We previously discussed why it is difficult for the large acquiring company to embrace and learn from the successes of the acquired company, for example leveraging some of the Canadian knowledge on how to assimilate acquisitions. It is partly due to the underlying attitude that ‘The tail can’t wag the dog’ when it comes to the small group influencing the much bigger one. However, an attempt to learn from IHS Energy Canada’s success in integrating its acquisitions might not only leverage the proven skill sets within the company but, if successful, it might also accelerate the value capture from strategic company investments

One interviewee believes that IHS Energy will never be a strong funder of R&D, “but it will continue to acquire companies that have innovation and fit into their industry, that may be very complimentary to the organization and grow a lot faster.” Some believe that the company will start stepping more into the service based aspect of business which is expected to be much tougher for the company to integrate. According to one interviewee “We just don’t have the width and breadth of experience with the consulting component (of acquisitions). We have some limited experience but if we are really going to grow in that space we are going to have to acquire a (lot of) companies who are dominant in that space. It is going to require quite a commitment on the part of both companies to take advantage of that integration right of the bat. You are going to look for companies that are going to use our content to compliment their services that is where we are going to get best value.”

In Robert Stringer's article on 'How to Manage Radical Innovation' California Management Review 2000, , he discusses how to stimulate innovation in large companies. In the article he considers 'working from the outside in' and he lists the reasons why most mergers, acquisitions and other external alliances fail to generate an ongoing stream of commercial breakthroughs. Given the emphasis on growth through acquisition at IHS Inc., it is worth considering what pitfalls exist when it comes to acquiring innovation companies.

According to Stringer; "The innovation-hungry company usually saw itself as acquiring a new product, rather than acquiring a new capability. Even when they realized that the radical innovation involved more than a specific product, they did not know how to learn about the capabilities. Too often, when this was the case, the acquisition or alliance created less, not more, innovation in the core business."

"In addition to the failure to learn from the alliance or acquired partner, the stumbling block frequently turned out to be the structure, culture and bureaucracy of the company desperate to innovate. Time and again, promising new products or technologies proved to be too radical, too threatening, or too different to be developed to their full commercial potential or to be leveraged back into the company's base business."

"On occasion, the big company simply drove away the entrepreneurs and innovators by attempting to guide, control, or influence the commercialization of their ideas. In other words, innovating setting industry leaders looked outside but kept trying to bring the innovation inside. Their focus on control and ownership of the innovations and the innovators, though appealing to the large company mentality, not only did not produce the desired stream of new commercial successes, it inhibited that stream by providing a false sense of progress."

7.2 PROMOTING AN OUTSOURCING ATTITUDE AMONG DEVELOPERS

AccuMap's successful approach of partnering with data suppliers from the very early days, working with them to improve integration or delivery, meant there was always openness to outside inventions and innovations. This approach of successful leveraging partners' technology led to a number of successful acquisitions later on.

As one original AccuMap developer put it; "It doesn't matter if it's not invented here, we can almost always buy it or license it or write it ourselves. It's simply a business decision based on time-to-market and available resources or money," This view was echoed by others who felt there was absolutely no resistance to outside innovations when it came to building technologies, creating technical processes or integrating 3rd party technologies.

Technology adaptations such as building the data loaders or dedicated compression routines, or adding new functionality were mainly done in-house. Sometimes adaptations required software modifications on the partner's application to work in the AccuMap application. In the early days about 80% of the technical work was completed in-house compared to 20% completed by partners. In the later days, there were a few partnerships where that ratio is flipped and AccuMap provided an exclusive link to the partner's data website, from within the appropriate context of the AccuMap application. In some cases data partners improved their technology and that increased speed of delivery to AccuMap, or increased speed of partnered runtime data to the customer. Those changes were not done solely for AccuMap, but AccuMap was usually more than ready to leverage those benefits.

This approach, allowing developers to outsource all or part of their work, is one of the best ways to establish and promote outsourcing practices. If, for example, developers are formally incentivized to look outside to find cost efficient ways to complete product development through connecting with other sources, then outsourcing becomes part of the culture, promoted from the bottom up instead of dictated from the top down. If this approach to development were truly promoted it could greatly reduce R&D costs in the long term.

This was the approach taken in Proctor & Gamble (P&G) as described in article ‘Connect and Develop’ by Larry Huston and Nabil Sakkab, Harvard Business Review, March 2006, . According to the abstract “By identifying promising ideas throughout the world and applying its own capabilities to them, P&G realized it could create better and cheaper products, faster. Now, the company collaborates with suppliers, competitors, scientists, entrepreneurs, and others (that's the connect part), systematically scouring the world for proven technologies, packages, and products that P&G can improve, scale up, and market (in other words, develop), either on its own or in partnership with other companies. Thanks partly to this connect-and-develop approach R&D productivity at Procter and Gamble has increased by nearly 60%”.

7.3 OPTIMIZING THE USE OF THE UNDERLYING ARCHITECTURE

AccuMap primarily relied on customer feedback regarding what new data and functionality to add. Developers believe that this had the benefit of keeping them focused on their core competency.

According to one former AccuMap developer “The model for much of the software/data extension of functionality was fairly simple – what was the key information needed in the workflows of each of our user types (geologist, engineer, land person, etc.).... We were extending a known success formula and had lots of extension work to do. These adaptations were a close reflection of the demand coming from our customer base for data and functionality lacking at the time.”

As predicted by Moore’s law, there was a doubling of processor speed and hard drive space approximately every 18 months. (In 1965 Gordon Moore, co-founder of Intel, predicted that transistor density on a silicon integrated circuit would double every 18 months. This became known as Moore’s Law,). AccuMap’s strong underlying architecture allowed them to quickly add more functions, write more robust and capable software and add significantly more data by utilizing greater amounts of RAM (Random Access Memory). Competitors failed to capitalize on these opportunities.

As significant strides were made in software usability AccuMap was able to copy and implement those changes readily. It was also able to take full advantage of improvements in software processes such as source code control and quality processes. This helped AccuMap deliver better software faster and with predictability and repeatability, without changing its core architecture.

According to the IHS Energy website “The vision for Enerdeq is to have all IHS commercial data available through the Enerdeq platform and to provide the mix of applications and data access methods that are appropriate for each of our varied markets and within your own company environments” Figure 7.4 below shows the way in which Enerdeq uses its common platform and Service Oriented Architecture (SOA) to meet an expanded set of customer needs and ultimately provide high performance customized solutions via its web services. As mentioned in Chapter 5 one former AccuMap developer saw that “The shared (Enerdeq) goal has expanded since 2003. There is even more consolidation than originally envisioned”. When the developers began to see the overlap, they realized how much of a difference they really could make if they shared the architecture. Certain architectural designs are now being adopted to allow products to be shared more easily. Clearly it was not just the developers from IHS Energy Canada who recognized the increasing number of consolidation opportunities. This is an example of where skills from the early success were naturally leveraged in promoting further innovative success.

Enerdeq Options: Fit for Purpose

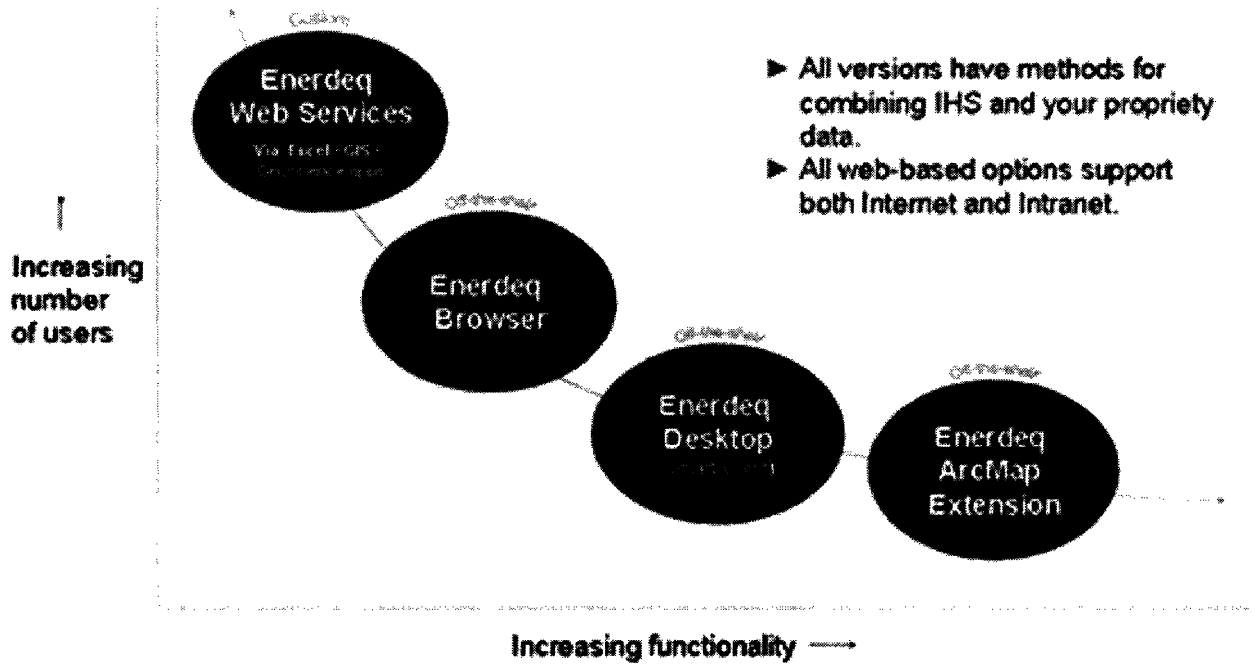


Figure 7.1

7.4 ALIGNING PROCESSES AND TOOLS BASED ON NEEDED

Most people agree that the main AccuMap development and commercial release process was very robust and it hasn't changed much in over 10 years, although it has evolved in terms of QA, code-reviews, beta builds, etc. as major adaptations were made. The last big development process change took place in recent years in order to align it more closely with the tools and processes of the Enerdeq team.

Most developers believe that this robust process is a core strength which can be aligned to partners or other developer's processes where necessary to foster innovation. There is a recent move to align all processes and tools for the sake of creating uniformity across all IHS worldwide IT development groups. This would allow the company to achieve economies of scale by having a smaller technology footprint. However, as mentioned in Chapter 4, one former AccuMap developer believes that leading the integration of development groups means building "a deep understanding of processes and technologies used by both development groups, with the goal of learning from each group". Merging of process or technology should be considered, but alignment should only take place where it makes sense. "Try not to merge or share just for the sake of it, it must benefit the customer in some way."

In section 5.2 one developer was quoted as saying; "There is some flexibility and some recognition of historic cultures in that groups don't have to change tools today." While others see absolutely no flexibility in the plan to implement a common tool set, this is an example of a leadership style which accommodates long term goals by acknowledging the pre-existing norms and practices established within certain group. By allowing groups some flexibility in when they can change tools, there is greater likelihood of getting them to identify with the adaptive process of discarding old practices. This increases the buy-in to creating a smaller technology footprint.

Success depends on being able to adapt to a new situation, keeping what is useful and dispose of what is no longer required. Simple as the theory is, it is incredibly difficult to achieve as is reflected in much of the literature. When it comes to innovation the key thing to focus on, according to many case studies, is the process that created the successful product rather than the product itself. An historical and scholarly view of innovation is given in the 1966 article ‘Gunfire at Sea: A Case Study of Innovation’, from Elting E. Morison/ *Men, Machines, and Modern Times*, (Cambridge, MA: The MIT Press), 1966. The study concludes that happiness and delight comes from identifying with the adaptive process itself.

“Historically such identification with process as opposed to product, with adventurous selection and adaptation as opposed to simple retention and possessiveness, has been difficult to achieve collectively. The Roman of the early republic, the Italian of the late fifteenth and early Sixteenth century, or the Englishman of Elizabeth’s time appear to have been most successful in seizing the new opportunities while conserving as much of the heritage of the past as he found relevant and useful to his purpose.

We seem to have fallen on times similar to theirs, when many of the existing forms and schemes have lost meaning in the face of dramatically altering circumstances. Like them we may find at least part of our salvation in identifying ourselves with the adaptive process and thus share with them some of the joy, exuberance, satisfaction, and security with which they went out to meet their changing times.”

7.5 CREATING AN URGENT NEED FOR INNOVATION AS COMPETITORS CATCH-UP

Success means paying attention to your environment. Customers have been looking for ‘open’ data systems for many years now. An ‘open’ data system would allow customers to integrate third party data or their own in-house data, data which gives them competitive advantage, into the application. Being able to include in-house or third party content could really differentiate a product but, to date no one has achieved an easy to install, high performance, fully integrated open system.

Competitors are catching up in other areas. AccuMap’s main competitor since the mid 90’s has been GeoScout, whose content and functionality has begun to rival that of AccuMap, offering better data sets and more functionality, specifically targeted at any apparent AccuMap weaknesses. Some feel that GeoScout has surpassed AccuMap from the geologists’ perspective in terms of functionality needs, and others believe that additional content in GeoScout is responsible for some recent loss in AccuMap’s market share. Although engineering users still state a preference for AccuMap, GeoScout is reportedly getting more new customers across the market. The two products currently co-exist in some of the big companies, because the market is buoyant and companies can accommodate preferences of different user groups. However, it would not take a significant shift for a large company to decide to standardize and choose only one system, as some companies have done. In such circumstances AccuMap could loose a foothold within some of its established large customer base.

Given these facts it is surprising to hear people express the view that the competition appears to have subsided recently, possibly because they still can’t match the IHS Energy content. Some believe that AccuMap still has momentum for a number of years simply because people are familiar with it and don’t necessarily want to switch yet. Others believe that changes in buyer patterns haven’t been seen yet due to the subscription nature of the business.

The IHS product development strategy, discussed in section 6.5 is very heavily reliant on the concept that ‘content is king’ and theirs is best. Here the AccuMap success and IHS content superiority provides a legacy of success and appears to remove any sense of urgency about the need for aggressive innovation even though they are currently going through a major ‘S-curve’ product transition.

7.6 ADDRESSING CULTURAL DIFFERENCES ALLOWS MORE FOCUS ON INNOVATION

Success for AccuMap meant attracting potential buyers, initially in 1998 being acquired by QC Data's Petroleum division and then in 2001, by IHS Energy Canada. Since then a lot of the innovative spirit appears to have gone into aggressively defending its culture. That feeling was summed up in the comment "distance alone (from head office in Denver) has preserved some of the good stuff."

Companies, like Cisco, who are highly successful in integrating acquisitions, agree that a cultural match is one of the first things to be considered. Without it they will not proceed, no matter how successful or profitable the potential acquisition is. It is clear from all those interviews that problems related to cultural mismatch continue today within the global matrixed organization. Arguably if developers are still addressing these issues they cannot be fully focused on the next generation product. How these issues can be resolved is best addressed by those dealing with the situation day to day, but all the functional managers have yet to buy into the need to do this. Promoting a culture of 'conflict and respect' could help to overcome the existing cultural barriers.

The optimum culture for an innovative organization is, according to MIT Sloan Professor Rebecca Henderson, "high conflict and high respect, with an underlying long term commitment to company goals". When the topic of conflict arose during interviews it was clear that there is no model for dealing with conflict within IHS Energy and there was a sense that conflict was not often brought into the open, particularly in the US offices. The Canadian office has a higher tolerance for conflict, where developers and other employees are encouraged to challenge the status quo, as it relates to company goals. In order for conflict to be constructive, people need to be held accountable for their work so that conflict does not become a vehicle for obstruction or an end in itself. In the global IT organization conflict has not been dealt with well. Many agreed that serious underlying conflict relating to integration issues went on much longer than it should have.

Rather than personalize any of the conflicts it is helpful to look at them solely in terms of work or critical tasks being done and see what barriers are being created by not openly addressing the opposing views. Going forward there is an opportunity to embrace conflict as a way of highlighting where immediate dialog needs to occur, so that the opposing groups or individuals can come up with an agreed definition of the 'work' to be done or the critical tasks that need to be addressed. The challenge is to adapt the definition of the work so that all stakeholders embrace it.

In 'Leadership Without Easy Answers,' Harvard's Professor Ronald Heifetz, looks at the importance of letting conflict emerge and the benefits of taking an adaptive rather than a control approach in managing a period of transition where conflict and disequilibrium occur. In a chapter entitled 'On a Razor's Edge' Heifetz discusses the need for leadership to maintain balance on the edge between developing and quelling conflict. Figure 7.2 shows a modified table showing the different outcomes that result in shifting from a control style to an adaptive style of leadership in different business or social situations.

Leadership with Authority (e.g. Manager) in Adaptive Situations

Business or Social function	Leadership Approach (or Situational type)	
	Control (or Technical)	Adaptive
Direction	Leader provides problem definition and solution	Leader identifies the adaptive challenge, provides diagnosis of conditions and produces questions about problem definition and solutions
Protection	Leader protects from external threat	Leader discloses external threat
Role Orientation	Leader orients	Leader disorients current roles or resists pressure to orient people in new roles too quickly
Controlling conflict	Leader restores order	Leader exposes conflict or lets it emerge
Norm maintenance	Leader maintains norms	Leader challenges norms or allows them to be challenged

“Leadership Without Easy Answers” Ronald A. Heifetz, 1994.

Figure 7.2

According to Heifetz; “Exercising leadership from a position of authority in adaptive situations means going against the grain. Rather than fulfilling the expectation for answers, one provides questions; rather than protecting people from outside threat, one lets people feel the threat in order to stimulate adaptation; instead of orienting people to their current roles, one disorients people so that new role relationships develop; rather than quelling conflict, one generates it; instead of maintaining norms, one challenges them.”

“Of course, real life is fluid. An Authority figure, even in adaptive situations will act differently to fulfill each of these social functions depending on several factors, as just mentioned: the severity of the problem, the resilience of the social system, the ripeness of the issue, and time. For example, in an organization one may have to act firmly to maintain norms and restore clear role assignments, while challenging people with questions and raising conflict about direction. But to make tactical decisions to move between technical and adaptive modes along each of these five dimensions, one first needs a clear conception of the differences.” (The five dimensions are shown in Figure 7.2 above.)

Conflict needs to be addressed by someone with decision making authority. Within the global IT group the command and control approach to decision making seems to be used most frequently. According to the sentiments expressed in this research this has proven to be effective only in adding resistance in the last three years. It is my belief that practicing an adaptive leadership style would allow both conflict and respect to co-exist in a way that would break down barriers and promote more creativity and innovativeness, which would increase productivity among the development community.

CHAPTER 8 – CONCLUSIONS & RECOMMENDATIONS ON HOW THE COMPANY CAN BECOME MORE INNOVATIVE

In the previous chapters we looked at problems facing IHS Inc., specifically relating to its ability to develop innovative data access and integration products, as it strives to be the global standard for enabling the best-in-class decision making processes in the oil and gas industry. We compared their innovation, leadership and cultural problems to problems of a similar nature, described in the literature or relevant case studies. We considered some barriers that exist due to previous innovation success, combined with the problems of being a modern day public company driven by investor expectations.

There are some strong recurring themes and the ten most significant themes are listed below. It is the combination of issues which coincide at IHS Energy that create the ongoing challenging situation. No single theme or observation holds prominence over the others as representing the issues that most need to be addressed. However I have listed them according to my interpretation of their potential impact on the company's ability to become more innovative in the future. There is no silver bullet. All these issues require attention.

1. Assimilating acquisitions and utilizing their R&D

In my opinion, making strategic acquisitions and assimilating those acquisitions will continue to have significant impact on the company's ability to become more innovative, for the reasons described in section 7.1. Given the emphasis on growth through acquisition at IHS Inc., it is worth considering what pitfalls exist when acquiring innovation companies. Clearly, IHS Inc. is not yet fully proficient in learning about the capabilities of the acquired company. According to Stringer's article few acquiring companies have developed these skills. In the case of IHS Inc there appears to be little interest or focus on finding acquisitions with a cultural fit, or leveraging the R&D skills or capabilities so innovation is more likely to slow down rather than improve. Geographical cultural differences definitely added to the challenges in assimilating the Canadian companies. The words of one executive manager at IHS Inc., 'The tail can't wag the dog,' summed up the willingness of the executive team to learn from its smaller successful groups. Yet IHS Energy Canada is acknowledged as having done a remarkable job of integrating its acquisitions. This is a prime example of where IHS has failed to learn about the full capabilities of one of its acquired company.

2. Understanding Emergent versus Deliberate Strategy

The most practical way in which IHS Energy can begin to consider its innovation problems today is by examining its emergent versus deliberate strategy as referenced in section 6.5. The aggregate project planning process, as referenced by Clayton M. Christensen in relation to this case is a good tool to help examine where and how resources are actually being used. The Enerdeq product, as it performs today reflects IHS Energy's emergent strategy. If this is where the company wishes to be in terms of performance, innovativeness and speed to market, then the strategy is fine. If the company has a desire to be more innovative in the data access and integration solutions it provides to its customers, then it needs to look more carefully at how the resources are being deployed and what people are actually choosing to prioritize. A strategy seldom works on its own. In the case of IHS it needs to be accompanied, amongst other things, by hiring and retention practices that actively support R&D growth.

3. Creating and articulating the vision

Most of the core group of interviewees agreed that there has been lack of clarity and motivation around global goals. This has resulted in lack of focus on resource related issues, particularly when it comes to innovation, as discussed in section 3.2. The decision to invest in R&D resources or not depends on how serious IHS Inc. is about creating innovative solutions for data access and integration products. Given its market dominance today, it is likely to be a major player in the oil and gas industry for some time to come. However, if the company wishes to become more innovative, that intention needs to be clearly defined as part of the deliberate company strategy and in turn needs to be linked to the company vision. Currently it is not. Articulating a vision which inspires innovation and creativity is essential. Today, none of the core interviewees see this company as an innovative one. There is a strong sense of optimism that the new CEO at IHS, Jerre Stead, will do much more than provide great rhetoric when it comes to supporting new product innovation at IHS.

4. Deploying a low cost strategic business model

IHS Inc can become more innovative, even using a low cost business development model, but to do this, it must address and pay close attention to, all of the other issues or themes summarized in the list. The constant and singular focus on cutting costs puts the company at risk of tipping into a firefighting mode, as described in section 5.3, because it is fueling an increase in employee turnover. I believe that people need to understand the cost cutting imperatives in the context of the bigger picture. For example, all interviewees sought more understanding of how to interpret global goals in the context of local or regional priorities. My recommendation is, to address the five issues relating to communicating the big picture goals, to all stakeholders as described in section 6.7.

5. Understanding ‘Worse Before Better’

As with all change it takes time and effort to implement. With a product innovation cycle this means investing time and money in getting all the loops in the cycle working effectively, as described in the system dynamics diagram in Figure 5.2. and in section 5.2. Things get worse before they get better when significant transition is undertaken, as has happened at IHS. The company needs to invest more to get beyond the ‘Worse Before Better’ cycle or it is at risk of tipping into constant firefighting mode as described above and in section 5.3. To mitigate this risk, IHS needs to empower functional managers, including product and project managers to make informed decisions so they are not operating in a crisis mode for extended periods. Each of the observations listed in section 5.6, relate to the issues raised regarding the transition to the global matrixed organization. As these are the issues that the people feel strongest about, in my view, these are the ones that need to be addressed.

6. Managing the tension between short and long term strategy

This is a management or executive skill which requires constant adaptation to changing business conditions. Functional managers look to the executives for guidance in this matter. All core interviewees felt that the emphasis at IHS Inc is given to short term cost cutting goals as discussed in section 6.4 and other sections. The right people skills exist in IHS to foster innovation, but these are constantly being eroded by turnover due to increasing focus on short term profits with little or no visibility on long term strategy. For the company to increase its innovation over time, this balance has to shift. People need to feel empowered to create, prioritize and act on long term goals. Their rewards and recognition need to be tied to such goals. If innovation is not part of the clearly articulated long term goals, then it won't really happen. The company must invest in innovation by setting a deliberate product development strategy that reflects the vision of being more innovative. Then it must follow through on that strategy.

7. Addressing culture and conflict

All those interviewed believed that the leadership at IHS needs to pay more attention to understanding and accommodating the differences in culture, because the associated problems have become amplified in the integrated IT groups. In sections 3.5, 6.2 and 7.6 the cultural issues are discussed in detail. I referred to MIT Professor Rebecca Henderson's belief that "high conflict and high respect, with an underlying long term commitment to company goals" is the optimal culture in technology innovation companies. As I concluded in section 7.6, conflict needs to be addressed by someone with decision making authority. Within the global IT group the command and control approach to decision making seems to be used most frequently. According to the sentiments expressed in this research, this has proven to be effective only in adding resistance in the last three years. It is my belief that practicing an adaptive leadership style, as described by Ronald Heifetz in 'Leadership Without Easy Answers', would allow both conflict and respect to co-exist in a way that would break down barriers and promote more creativity and innovativeness. This would in-turn increase productivity in the product development community.

8. Creating a sense of urgency around innovation

In sections 6.3 and 7.5 we discussed how heavily reliant IHS is on the strongly held belief that 'content is king' and that IHS content is best. While this is true, the company's highly valued historical data (pre 1970's) could become less of a competitive advantage as customs and competitors build and acquire more data sets themselves. In my view the AccuMap product success and the IHS content superiority provides a legacy of success. This appears to remove any sense of urgency about the need for aggressive innovation, even though the company is going through a major product transition. The only urgency is to replace the current product in the shortest time possible. Employees need to have a strong sense of urgency and excitement around creating new products. Section 6.7 summarizes the issues needed to maintain an efficient and cost effective product development processes. These need to be addressed with an emphasis on creating informal skunk-works projects or other forms of think-tanks to give visible commitment to the long term need for innovative product development.

9. Promoting an outsourcing attitude among developers

If developers are formally incentivised to connect with other innovation sources, by looking outside the company to find cost efficient ways to complete product development, then outsourcing becomes part of the company's innovation culture (as discussed in section 7.2). Proctor & Gamble increased their productivity by nearly 60% using this approach, . IHS has been aggressively investigating outsourcing options for IT for some time. In my view, if outsourcing was promoted from the bottom up, instead of just imposed from the top down, then the company could reduce R&D costs and become a lot more innovative in the long term.

10. Aligning processes and tools based on needs

Section 7.4 looks at how success depends on being able to adapt to a new situation, keeping what is useful and disposing of what is no longer required. Today IHS strives to create a smaller technology footprint by establishing a common set of tools across the corporation. In my view, by allowing groups some flexibility in aligning their processes and tools, there is greater likelihood of getting them to identify with the adaptive process of discarding old practices to make way for the new. Given that IHS will extend the use of this common tool set as it acquires other profitable and creative companies, it will need to assimilate their capabilities in a more effective way. Empowering IT developers to align their processes and tools on an 'as needs basis', is likely to result in the retention of more innovative capabilities as they integrate into the formidable IHS organization.

APPENDIX 1

- 1.0 What were the essential components of AccuMap's breakthrough innovation success?**
 - 1.1 To what extent was the initial AccuMap business plan based on the commercial opportunity versus identifying a potential breakthrough technology
 - 1.2 What was the technology opportunity which AccuMap captured over its competitors?
 - 1.3 What early benchmarking (if any) was done of the new technology versus industry tools?
 - 1.4 How did AccuMap capture and maintain first mover advantage in the market?
 - 1.5 What difficulties did AccuMap face when launching itself in the marketplace?
 - 1.6 What were the major technical adaptations that took place within the AccuMap product since 1991?(e.g. platform evolution, integration of datasets, etc)
 - 1.8 What accompanying cultural adaptations were necessary? How were they implemented?
 - 1.9 How flexible was the company in adapting its strategy or product technology?
 - 1.10 To what extent were subsequent technology adaptations or changes completed in-house versus in collaboration with partners?
 - 1.11 How did AccuMap gain investor confidence? On what basis were returns guaranteed (customer commitment, niche market potential, and exit strategy)?

- 2.0 How do Leadership styles and values impact a company's ability to create radically innovative products?**
 - 2.1 Did the early leader of AccuMap know where he was going (what he was doing)?
 - 2.2 Did he change his mind? Did he adapt to the changing environment?
 - 2.3 After the founder left, did the subsequent executive leader know where he was going?
 - 2.4 Did he change his mind? Did he adapt to the changing environment?
 - 2.5 What attributes are necessary to lead the company when it is pioneering a technology breakthrough and /or new innovation?
 - 2.6 What attributes are necessary to lead the company when it is sustaining its technology advantage in order to increase performance?
 - 2.7 What attributes are necessary to lead the integration of technology development groups in a merged organization?
 - 2.8 Which of the attributes in the above three questions is most relevant today?

- 3.0 How does the legacy of success help or hinder further innovative success?**
 - 3.1 Since the early 90's what other technology developments have had significant impact on the market in which AccuMap has been the dominant player.
 - 3.2 Who played the lead roles (e.g. gatekeepers etc) in identifying and assessing relevant industry technology developments?

- 3.3 What related industry innovations or advances were missed (if any) and why?
- 3.4 To what extent are there barriers to innovations which are ‘not-invented-here’?
- 3.5 How much of the original development process is still in place versus how much has been adapted to capture the changing technology landscape?
- 3.6 When and how did the competition begin to capture market share (from perspective of advances in innovation)?

- 4.0 What technical and cultural adaptations were needed to integrate the AccuMap product into the Enerdeq product platform?**
- 4.1 What major technology integration and changes had to take place within the merged development organizations (e.g. platform, tools etc)? Who facilitated this?
- 4.2 What differences existed in the way innovative success was promoted, managed and rewarded?
- 4.3 What were the expected and unexpected barriers to integration?
- 4.4 What were the commonly understood goals of the merged development organization?
- 4.5 What (cultural and technical) losses did each development group experience and how were these losses managed?
- 4.6 Which of the development cultures prevailed? Who leads versus contributes? Why?

- 5.0 What lessons has IHS Energy learned in moving from a regional BU controlled software development function, to global, functionally controlled BU’s within a global matrix organization (e.g. what has the company gained/lost?)**
- 5.1 How much of the company’s technical innovation is driven by the need for business growth versus changing customer segmentation needs versus changes in innovative landscape?
- 5.2 What new markets (or needs of top segmented customers) are being served by ‘Enerdeq’ which were not being served by AccuMap?
- 5.3 How effective are the new functionally controlled business units in translating customer needs to innovation requirements? What and where are the gaps
- 5.4 What losses did the various business units experience (with respect to their strategic role and cultural). How were these losses managed?
- 5.5 What aspects (if any) of a pioneering culture have been maintained in the matrix structured organization? Why have they succeeded and how do they continue to add value?

- 6.0 What are the company’s current barriers to innovation (in product development) (e.g. leadership, culture, financial performance, etc)?**
- 6.1 Does the leader clearly understand the company’s innovation strategy? How well does he communicate this?
- 6.2 How does he adapt the strategy to changing environment (e.g. vision and values, sustained R&D funding, non-operational financial performance metrics, etc)
- 6.3 Is IHS Energy adapting its development strategy to incorporate the next generation needs of its customers? How effectively is strategy deployment?

- 6.4 To what extent are IHS Energy's sustaining innovations threatened by new disruptive innovations from new market entrants or collaborative ventures?
- 6.5 What barriers do competitors face in entering this arena?
- 6.6 What commitments (financial and otherwise) has IHS Energy made in order to enter the industry's emerging markets? How does this compare to the competition?
- 6.7 When conflicts of interest are identified how does IHS Energy manage these, externally with complementors and internal with business units?
- 6.8 How adaptable and effective is the structure in mitigating these conflicts?

- 7.0 How does the company become more innovative and develop more new high quality products faster?**
- 7.1 Is IHS Energy a technology platform leader? If not, does it aspire to be one?
- 7.2 Who are its complementors and how open are the interfaces?
- 7.3 To what extent is use of open innovation (external development groups) encouraged?
- 7.4 How has IHS Energy captured the lessons learned from product development delays, staff turnover, or loss of existing market share?
- 7.5 What capabilities does the company need to acquire or develop?
- 7.6 What vision for market leadership does IHS Energy have with regard to its product? and innovation vision for development strategy adapted to meet the changes in
- 7.7 What markets does IHS Energy want to capture?

NOTES:

Questions 1.1, 1.3, 1.8 & 1.10 are based on the evaluation of software start-ups, 'The Business of Software', Michael A. Cusumano, 2004, .

Questions 6.3, 6.4 and 6.5 are based on Clayton M. Christensen, insights into how great firms can fail from 'Innovator's Dilemma' 2002, .

Question 7.1 and 7.2 are based on work of Michael A. Cusumano & Annabelle Gawer, 'Elements of Platform leadership' (SMR Spring 2002, vol. 43, no. 3), .

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