Innovation in a Recession

Zoran Veselic

Applied Project (APRJ-699)
Word Count: 14,428

Applied Project Supervisor: Dr. Conor Vibert

Submission Date: July 6, 2010
# Table of Contents

1. Introduction .................................................................................................... 3  
   1.1. Assumptions ............................................................................................ 3  
   1.2. Basic Argument ....................................................................................... 3  
   1.3. Research Questions ................................................................................ 3  
   1.4. Structure of Paper .................................................................................... 4  
2. Literature Review ........................................................................................... 5  
   2.1. Innovation Strategies ............................................................................... 5  
   2.2. Lessons Learned from Previous Recessions ......................................... 12  
   2.3. R&D Investment During Recessions ...................................................... 16  
3. Hypotheses .................................................................................................. 20  
4. Methodology ................................................................................................ 20  
5. Results / Discussion .................................................................................... 21  
   5.1. Hypothesis #1 ........................................................................................ 21  
      5.1.1. Innovation Process .......................................................................... 22  
      5.1.2. Basic Framework of Strategic Analysis ........................................... 23  
      5.1.3. Five Forces Industry Analysis ......................................................... 24  
      5.1.4. Resources and Capabilities ............................................................. 26  
   5.2. Hypothesis #2 ........................................................................................ 28  
      5.2.1. Previous Recessions ....................................................................... 28  
      5.2.2. Corporation as Living Organism ...................................................... 29  
      5.2.3. Strategic Innovations ....................................................................... 29  
      5.2.4. Role of Senior Executives ............................................................... 31  
      5.2.5. Centralized vs. Decentralized Organizational Structure .................. 32  
      5.2.6. Organizational Learning .................................................................. 33  
6. Conclusion ................................................................................................... 33  
   6.1. Summary ............................................................................................... 33  
   6.2. Shortcomings ......................................................................................... 34  
   6.3. Implications for Managers ...................................................................... 35  
   6.4. Suggestions for Future Research .......................................................... 35  
7. References .................................................................................................. 36
1. **Introduction**

Throughout the Industrial and Information Ages, great companies and leaders have used recessions to create breakthrough innovations in technologies, products, services and business models. On the other hand, many companies have not survived economic downturns. Since 2008, the world has been experiencing one of the deepest recessions in recent history. This recession, also referred to as the Great Recession, created many difficulties for businesses on a global basis. Every aspect of a business is scrutinized including capital spending, human resources management, operations, engineering, and R&D (research and development). At times when expenses are cut and the cash flow is tightly controlled, all companies need to make crucial decisions where and how to deploy their finite resources and capabilities. Those companies that invest in innovations during recessions are well positioned to enjoy fast growth during economic recovery. The main challenge that companies face is how to do it in a recession when the main focus is on their very survival.

1.1. **Assumptions**

Assumptions, that underlie this paper, are that companies recognize a need to continue to innovate during recessions and that they do not lose sight of the long-term sustainability of their businesses and the future competitiveness. The current recession is not the first one and an assumption is that it won’t be the last one. All businesses and markets go through business cycles of economic prosperity and economic decline. An analysis of what happened during previous recessions in terms of innovation can provide us with valuable lessons that we can learn from, and apply during the current downturn. The topic of a relationship between innovation and recessions primarily belongs to strategy as a management domain.

1.2. **Basic Argument**

The basic argument of this paper is that it is essential for companies to identify elements that increase the likelihood of successful innovations in order to generate the highest possible return on the R&D investment as the needs and priorities of customers change during recessionary times. The choice of what to invest in depends on a number of factors that define the external environment of a company.

1.3. **Research Questions**

Two main research questions that are raised in this paper are:

1. How do companies invest their R&D money during recessionary times in order to increase the probability of successful innovations with the highest possible return on investment?
2. What lessons can we learn from previous recessions that will help us with strategic decision making during the current recession?

I work for Christie Digital Systems out of Kitchener in Ontario as vice president of Visual Environments, one of four strategic business units. Christie is the world leader in high performance video and data projection solutions. As a company that belongs to the projection industry within the technology sector, Christie is faced with continuous pressure to invest in R&D and continue to innovate as a base of the company’s competitive advantage and differentiation. A leading innovator in film projection since 1929 and a pioneer in digital projection systems since 1979, Christie has established a global reputation as a total provider of a variety of projection solutions. Christie is organized in four strategic business units: Business Products, Entertainment Solutions, Visual Environments and Managed Services. The company offers comprehensive solutions for cinema, large audience venues, control rooms, business presentations, training facilities, 3D and virtual reality, simulation and education. Christie designs, builds and installs customized visual solutions to meet visual communication requirements of world-class organizations within energy, military training and simulation, manufacturing and design, pharmaceutical, aerospace, government agencies, and entertainment. Christie’s unique projection systems and innovative structures are found in major corporations, commercial, and defense applications worldwide. Christie offers extensive managed services to the customers that need continuous remote monitoring and control of the projection systems. The projection industry is a global industry with the majority of the manufacturers from Japan, Asia Pacific and Europe. Christie is the leading manufacturer of digital projection systems in the Americas. The importance value of this research is high. At Christie, technological innovations are always seen as strategic. But innovations do not stay just on the technological level. The product innovations are only one part of the innovation portfolio. It is important to also look for innovations in processes, business models, financial transactions, marketing communication, operations and other areas of the business.

1.4. Structure of Paper

The rest of this paper is organized in the following order:
- Literature Review
- Hypotheses
- Methodology
- Results/Discussion
- Conclusion
- References

The research includes a literature review that covers innovation strategies, R&D investment during recessions, and theoretical concepts under examination such as strategic planning, recession, innovation etc.
The literature review is followed by a set of hypotheses that are statements for each of the research questions. After the set of hypotheses, the next section of the paper describes the methodology of how evidence to support or not support the hypotheses is collected. The information used in this paper comes from secondary sources. The section describes how the sources of information are found and the process that is used to respond to the hypotheses or provide evidence to support or not support each one of them.

The results/discussion section follows the methodology section and is focused on the analysis. The paper is based on data from literature, publicly available corporate documents, articles and reports. The paper is not based on direct interviews therefore the results will not include any interview notes. The results outline relationships between various concepts, models and frameworks that relate to the aspects of innovations in terms of business processes, organizational structures, management, and human capital.

The conclusion section follows the analysis and it summarizes the paper, identifies its shortcomings and also discusses implications for managers as users of the paper. This section also offers suggestions for future research. The last section of the paper includes all references.

2. Literature Review

This literature review is based on articles from reputable journals, books and papers dealing with the topics of innovations and recessions. It includes three parts:

- What steps the researchers have recommended in order to increase the probability of, not just any, but successful innovations.
- What lessons learned from past recessions can teach us about decision making during the current recession. This is directly related to the research question in this paper that looks for the impact of previous recessions on new product development and the R&D spending.
- What others have written in relation to the R&D investment during recessionary times.

2.1. Innovation Strategies

Typical recessions, as periods of economic decline, last between 6 and 16 months and this Great Recession is longer and deeper. It was triggered by a number of economic conditions from easy credit and subprime mortgages to the consequent freeze of capital markets. Across-the-board cost cutting, including capital spending and layoffs are standard short-term strategies used by many companies. These strategies may secure survival, but leading companies are those that invest in innovations to differentiate themselves from their competitors. Corporate capabilities exist in resources, processes and values (Christensen, Raynor, 2003) and represent any combination of distinctive and actionable ideas,
skills, or competences that allow a company to consistently attract its customers and execute better than its competitors (Couto et al., 2009). By designing a portfolio of capabilities needed to win customers, companies can develop sustainable competitive advantages. Senior executives who creatively and rapidly maximize strategic opportunities will prosper. Those who limit their approach to indiscriminate cost-cutting and other reactionary moves will not.

The first priority is to ensure a company’s short-term survival. The business must be protected. Greater efficiency is needed through thoughtful cost reduction, cash and working capital management, organization redesign and process improvements. Top management must mitigate risks by investing in customer retention, managing credit, exercising prudence in capital investment, divesting non-core assets, and securing lines of credit and additional equity capital. Survival strategies are not likely to foster sustainable competitive advantage. History suggests that focusing solely on cost reductions during a downturn rarely results in superior long-term performance (Reeves, Deimler, 2009). The objective is to identify short-term savings that provide a significant payoff with minimal time and investment, eliminate inefficiencies without reducing corporate capabilities and produce long-term results. It is important to distinguish structural from nonstructural costs as they require different strategies. Short-term (within six months) cost control tactics are expense cuts, layoffs, aggressive working capital management, discretionary spend reductions, salary freezes and incentive changes. Winning companies make decisions that take advantage of their unique capabilities, add businesses that complement or extend those capabilities, and divest businesses that require inconsistent capabilities, driving down costs in the process. Most companies delegate authority and accountability for implementing cost-cutting measures to their business units. Some level of enterprise integration is necessary to ensure that cuts are being made in the right places and with sufficient speed and discipline.

**Figure 1: Companies Execution Strategy for Recession Response (% of respondents)**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralized program management office drives enterprise-wide efforts</td>
<td>28%</td>
</tr>
<tr>
<td>Corporate tracks overall progress, but business units execute initiatives</td>
<td>38%</td>
</tr>
<tr>
<td>Individual teams in business units report to key business leaders</td>
<td>24%</td>
</tr>
<tr>
<td>Business units have discretion to manage to their own initiative</td>
<td>10%</td>
</tr>
</tbody>
</table>

Source: Couto et al., (2009)
Couto et al., (2009) outlined the following innovation strategies in a recession:
- Focus on the future by concentrating on businesses that are long-term winners and targeting the best customers.
- Prepare to lower the breakeven point to remain profitable under the worst-case scenario, reduce capacity, complexity, and fixed costs.
- Anticipate future industry structure due to new structural shifts and the impact of potential government intervention.
- Create a plan: if the industry needs to consolidate, companies need to decide whether they are buyers or sellers, and to prioritize and use R&D or capital investments offensively.
- Prepare for the upturn, e.g. prepare to recapitalize the financial debt if the stimulus packages overshoot.

How R&D executives respond to the changes in customer priorities will determine the future of their businesses. Those companies that take advantage of recessions to position themselves for future growth either refocus their investments on core R&D or tailor their innovations to new market realities (Jaruzelski, Holman, 2009).

As globalization brings new challenges during economic growth, it is even more critical during economic downturns. It is unwise for companies to neglect their R&D investments as they can fall behind their competitors anywhere in the world. There is a number of steps that companies need to consider (Frey, Callahan, 2008; Jaruzelski, Holman, 2009):

- Start scenario planning with likely market changes and outcomes. The market turmoil will create new opportunities. Innovation is associated with new product development but also can be used for innovative cost-cutting. Brainstorm new ideas and opportunities to increase efficiency. Innovation of new business models that are adapted to changing external environment complements the product innovation. It is very difficult to change business models and transform an organization so running multiple business model experiments and testing them with customers is prudent. Clearly, without robust strategies that increase the odds of survival there is no possibility of sustainable competitive advantage. But without diversity, experimentation, and even some degree of redundancy, there can be no resilience in the face of change. In a post-recession landscape, resilience as an ongoing ability to anticipate and adapt to critical strategic shifts will become an increasingly important driver of future competitive advantage. Companies can no longer count on market share to guarantee future profitability. Resilient organizations see opportunities and risks more clearly and respond to them more effectively and more rapidly. Organizations with foresight actively monitor key trends and events that could create opportunities and risks and conduct scenario planning relative to the trends and trigger events. Companies need to be agile in responding to disruptive events and trends as well as being
flexible in absorbing or reacting decisively to the events. Those that approach the market in an entrepreneurial way are more capable of dealing with unstable and changing markets as they have capabilities to explore, design, test and implement new business models. Diversity of perspectives and an ability to shape the competitive environment are additional characteristics of resilient companies. Bold leaders can maximize the opportunities even at the time of crisis.

- Companies need to understand new customer needs so they can shift investments to those projects that help customers deal with economic downturn. Customers always have problems to solve, even in a recession but they are adjusting to new market realities in terms of what products and services are their priorities. Companies need to address customer priorities and improve customer experience. The worst thing these companies can do in a recession is to continue to do the same things as they have been doing before the recession. Instead, they need to realign their business models to address customers’ new needs and priorities. Five questions need to be answered by companies: who they serve, what they provide, how they provide it, how they make money, and how they differentiate and sustain their competitive advantages.

- Customers want the best value when they select products and services so the primary objective of companies is to deliver more value to their customers for less money. Companies need to accelerate and optimize new products with a clear market advantage. It is important to pay special attention to the features that customers value and benefit most from, but without compromising quality.

- Eliminate weak R&D projects that hold the company back when it needs to focus on the projects that have the highest probability of success. All recessions challenge the R&D projects with high-end offerings. The product lines need to be reduced and focused on addressing current or future customer needs. Each product needs to stay within the core corporate strategy so it can leverage core corporate capabilities. Companies need to get rid of the riskier, longer-term programs and spend the R&D money on more promising and short-term projects that are the highest priorities. They waste their resources by using them on wrong activities and projects. Any internal organizational barrier that delays decision making and actions needs to be removed. Senior executives may use three different approaches in prioritizing their development projects. The first approach considers the first year revenues of each of the development projects and those with the highest immediate revenues are preserved. The second approach is based on net present value of future cash flows of the development projects. The third approach suggests answering questions such as: what the upside potential of each project is, how much risk remains, how well the idea fits qualitative criteria and how much it contributes to the business (Anthony, 2009). Each approach needs to be looked at from short-term and long-term points of view. Whatever approach a company selects to use in assessing its priorities,
staying focused and positive will increase the chances of success.
Companies need to fix innovation capability gaps by analyzing strengths
and weaknesses of their corporate innovation processes.

- It is important to test new ideas and learn from them as fast as possible.
Rapid prototyping of products and business models that can be quickly
tested and deployed can be used to tune innovation ideas and check their
viability. This can reveal new opportunities through employee focus
groups, mock-ups, simulation and beta tests. Once a winning idea is
identified it must be executed fast. Incubation is one of the ways to nurture
innovation and initiatives that may drive future competitive advantage.

- Companies should look for the ideas internally and externally by engaging
R&D talent from other countries. Partnering with other companies that
provide complementary products and services is another way to share
costs and risks. Top management should look for opportunities to secure
other scarce assets from competitors weakened by a recession: talent,
intellectual property, brands or overall companies. Recessions reveal
many bargains in terms of new technologies as cash-strapped companies
are forced to sell their technologies or intellectual property. Also,
partnering with suppliers or customers in order to better manage the value
chain, inventory, or transaction costs for mutual benefit can improve a
company’s position in the market. Suppliers are sources of innovations as
well. Making suppliers more successful will make companies more
successful. Even partnering with competitors might be considered in order
to share some resources, services, capabilities, assets or to shape the
regulatory environment defined by the governments.

- Adding services to the products can extend their life in the existing or new
applications. Changing business models is another way of addressing new
market conditions. A recession may offer opportunities to introduce new
services, such as financing, that enhance a company’s value proposition
for budget-strapped customers. Companies could add new offerings to
their product lines to stimulate sales. Pricing and contracting can
represent powerful ways to change the way a company does business, for
example “pay as you go” models or “pay for the use” of a product.
Bundling products, financing and service can protect margins. Companies
need to look at entering new markets and exiting old ones and other ways
how to capture key customers from their rivals.

- Talented people have many opportunities regardless of the times the
economy is in. Companies need to look strategically at their human capital
and preserve their talent. Innovation is impossible without strong, skillful
and knowledgeable human resources. At the end of the day, what makes
the real difference are the people.

- Incumbents tend to ignore new entrants’ products as too basic and they
typically “overshoot” the needs of their key customers, who may be
looking for more basic, inexpensive options during a recession
(Christensen, 1997). Companies need to conduct a disruptive threat
assessment. Simplification almost always reduces costs and simple-to-use products keep customers happy.

In a recession, it is important to keep costs down as cash flow is essential but just focusing on costs is not enough. Recessions deliver threats, but also deliver opportunities for those organizations willing to remain open to such opportunities. The innovation strategy is to rapidly adapt to environmental changes and to reinvent new sources of profit before the old ones disappear. Some of the worst mistakes in a recession are to cut back on new product development, replace growth-oriented CEOs with cost-cutting CEOs, retreat from globalization, replace innovation as the key strategy, reinforce hierarchy instead of collaboration, and retreat.

One of the most influential books written on the topic of innovation and disruptive technologies is “The Innovator’s Dilemma” by Clayton Christensen, Associate Professor of business administration at Harvard Business School. In this 1997 book, Prof. Christensen introduced principles of disruptive innovation which outline that there are times at which it is right to invest in developing lower-performance products that promise lower margins, and to pursue small rather than substantial markets. The book introduces the Failure Framework to explain why sound decisions by good managers can lead successful companies to a failure. There is a critical distinction between sustaining (incrementally improving existing products or services) and disruptive technologies that are the cause of problems to the incumbents. In 2003, Clayton Christensen and Michael Raynor wrote the answer to The Innovator’s Dilemma called “The Innovator’s Solution”. The new book suggested the ways how companies could create disruptive innovations rather than being destroyed by them. The authors state that the disruptive innovation model can support a sustainable and profitable growth. These disruptive innovations bring new products that are not as good as the existing products, but are simpler, more convenient and less expensive. These innovations target low-end customers but over time move up-market. Smaller companies that offer disruptive innovations and technologies are more agile in pursuing emerging growth markets that are in sync with their core values. These companies can operate at lower margins and they create disruptive growth engine that drives ongoing success. The book addresses a number of issues related to how to identify disruptive potential of an idea, how to identify market segments that are targets for the new disruptive innovation, how to structure a new venture and how to choose the right managers to lead it. The main reason why it is so hard to achieve new growth is a lack of understanding of the process for creating new-growth businesses. The process of innovation can be more predictable with the understanding of the forces that act upon the managers and what they choose and don’t choose to do. Mid-level managers take partially formed ideas into fully pledged business plans in an effort to win funding from senior executives. These managers typically hesitate to support new product ideas whose market is not assured as the company may waste a lot of money. Feedback from top customers add to credibility of managers for the ideas with a
potential but it comes from existing customers of similar products that have been successful in the past. Managers who support ideas that fail do not get promoted as their good judgment is questioned. Therefore, mid-level managers who want to have successful careers tend to promote only those new ideas that will pay off within the time that they reside in that particular job. The process favors the ideas that resemble those ideas that were approved and became successful in the past. The Innovator’s Dilemma summarized a theory that explain how, under certain circumstances, the mechanism of profit-maximizing resource allocation causes well-run companies to get destroyed. The Innovator’s Solution summarizes a set of theories that can guide managers who need to grow new businesses with predictable success, to become the disruptors and ultimately destroy well-run, established competitors. In sustaining circumstances when the objective is to make better products that can be sold for more money to top customers the incumbents almost always prevail. In disruptive circumstances when the objective is to commercialize a simpler, more convenient product that sells for less money and appeals to new or unattractive customers the entrants are likely to beat the incumbents.

The best way for new companies to attack established competitors is to disrupt them with the products that are not as good as currently available products. Once the disruptive product gains a foothold in new or low-end markets, the sustaining improvement cycle begins. When disruptive products improve enough to intersect with the needs of more demanding customers, the disruptor is on a path that will crush the incumbents that have the resource allocation process designed to support sustaining innovations, and therefore are unable to respond. The incumbents are always motivated to go up-market and almost never motivated to defend the new or low-end markets that the disruptors find attractive. Prof. Christensen calls this an asymmetric motivation which is in the core of the innovator’s dilemma. Industry leaders fail to invest in protecting the least profitable end of their business with the least loyal and the most price sensitive customers. That’s the opening for a disruptor. The leaders choose to invest to strengthen their position in the most profitable tiers of the business with customers who reward them with premium prices for better products. The industry incumbents encounter predictable forces that motivate them to flee rather than fight when attacked from below. That is why shaping a business idea into a disruption is an effective strategy for beating an established competitor. The forces that propel well-managed companies up-market are always at work in every industry. The source of the dilemma is that sustaining innovations are so important and attractive, relative to disruptive ones, that the very best sustaining companies systematically ignore disruptive threats and opportunities until the game is over.

A sustaining technology strategy is not a viable way to build new-growth business. If a company creates and attempts to sell a better product into an established market to capture established competitors’ best customers, these competitors will be motivated to fight rather than flee. This is true regardless of the size of two companies. Managers who want to create new-growth businesses should target products and markets that established companies are motivated to
ignore or run away from. They need to frame the disruption as a threat in order to secure resource commitments and then focus on a search for growth opportunities. The companies that are positioned at the spot in a value chain where performance is not yet good enough will capture the profit. That is a circumstance where differentiated products, scale-based cost advantages, and high entry barriers can be created.

### 2.2. Lessons Learned from Previous Recessions

The lessons that companies can learn from previous recessions can help in dealing with the existing recession. Some of the most innovative ideas have emerged during times of economic decline (Wyckoff, 2009; Filloux, 2009).

During the Great Depression 3M invented the Scotch Tape in 1930, Revlon launched the long-lasting nail polish in 1932 and GE introduced the fluorescent light bulb in 1938. Bill Hewlett and Dave Packard established Hewlett-Packard in 1939. The first recession after the World War II started in November 1948 and lasted until October 1949. The mobile telephone was invented in the USA in 1947. During the following year’s recession, the mobile service expanded across the country. During this recession GDP (Gross Domestic Product) contracted by 0.5% and unemployment peaked at 7.9%. To put these numbers in perspective, the US GDP for Q4 2008 was down 6.2% compared to a year before and the unemployment rate was 8.1%.

The first McDonald’s opened in 1955 and the Hula Hoop was introduced in 1958. Today widely used in medicine and telecommunications, the laser was invented in 1958. In January of that year, the real growth rate of the American GDP was down 10.87 % from a year before and the unemployment rate reached 7.4% in the middle of that year. In 1958, Jack Kilby created the first integrated circuit at Texas Instruments and NEC created Japan’s first electronic computer.

In October 1969, the US GDP showed a decline of 1.9% versus a year before. That year, the number of patents granted in the USA was up by 14% (after a drop of 10% the year before). The era of the Vietnam War was marked by the first energy-caused recession with the oil shock of 1973. Between November 1973 and March 1975, the US GDP contracted severely: Q1 1974: –3.47%, Q2 1974: +1.15%, Q3 1974: –3.87%, Q4 1974: –1.6%, and Q4 1975: –4.7%. Unemployment reached 9% in May 1975. During the same time, new technology breakthroughs were introduced. Bob Metcalfe invented the Ethernet, the network that is a backbone of most businesses today. Xerox Palo Alto Research Center (PARC) introduced the Alto, a computer featuring the first graphic user interface with windows, menus, and mouse. Four years later, Steve Jobs visited Xerox PARC and implemented these features into the Lisa and the Macintosh. DARPA, the Pentagon’s research agency, created the TCP/IP protocol, which, today, remains the Internet’s foundation. In 1974, 3M Post-it Notes were invented and the following year Bill Gates and Paul Allen started Microsoft.
The 1981-1982 economic contraction resulted in negative GDP in the USA: -4.9% in Q4 1981 and -6.4% in 1982. During the last two months of 1982, unemployment rate climbed to 10.8% and stayed above the 10% level up until July 1983. In 1981, despite the recession, IBM introduced the first personal computer running the MS-DOS operating system designed by Microsoft. A year later, Cray sold the first X-MP supercomputer to the defense and the oil industry. The Commodore 64 personal computer was launched in 1982. Another innovation, during this recession, was the first commercial integrated application program: Lotus 1-2-3, featuring a spreadsheet, a word-processor and a database in one software package. In 1981, the introduction of MTV changed the music industry and Diet Coke was launched by Coca Cola one year later.

The last recession of the 20th century was a mild one. At its quarterly peak, in Q4 1990, the US GDP declined by 3%. During that year, a British computer scientist Tim Berners-Lee created the World Wide Web by implementing the first HTTP (Hypertext Transfer Protocol) connection on December 25, 1990.

The first recession of the 21st century was a result of the implosion of dotcom companies and the events of September 11, 2001. In 2001, Apple introduced the iPod and in 2002 Research In Motion (RIM) introduced their BlackBerry 5810.

The current recession is very deep in terms of unemployment level versus the previous ones. After 14 months it showed an employment situation worse than in previous recessions. In terms of length, ten previous postwar recessions lasted between 6 and 16 months, averaging about 10.5 months. The latest one started in the final months of 2007, and it is already beyond that. As the current recession is deeper and longer than the previous ones, it is very important to understand what worked and didn’t work in the past. Future recessions may have different dynamics and attributes but learning from the past prevents mistakes to be repeated in the future.

Wyckoff (2009) states that as financial markets collapsed in 2008, venture investments plunged 60% in the first quarter of 2009 relative to a year earlier. Productivity gains and GDP growth are strongly linked to new technologies and investment in intellectual assets. R&D investment is a powerful driver of innovation but it is not the only one. Globalization has changed the way economies transform knowledge into market value – the definition of innovation. New approaches to design, marketing and distribution are powerful drivers of growth as well. Skills, networks and trading knowledge are vital in order to compete efficiently in today’s economy where information travels in real time. Companies increasingly collaborate to reduce their costs and risks of bringing new ideas to the market by tapping into expertise around the world. The Internet has become a platform for new business models in marketing, retail sales and distribution. The economic crisis has prompted the creation of huge stimulus plans by many governments. By investing part of these packages in innovation and international collaboration, the governments have an opportunity to
accelerate scientific breakthroughs and innovative solutions with global appeal. On the environment side, the governments are spending billions of dollars to help drive a “green” recovery. The goal is to provide incentives for the development and commercialization of innovations in energy generation and transportation that will lower energy use and carbon emissions. Several countries have demonstrated the powerful impact of increased spending on innovation during a downturn. Finland emerged from a severe recession in early 1990s with a strong communications technology industry, and a higher-skilled workforce. Finland nearly doubled public investment in R&D from 1991 to 1995. By 1995, Finland’s GDP rebounded to 5%. For economies around the world, innovation can deliver a sustainable recovery and progress on social goals. Companies need to assess how well their business models serve the “downturn needs” especially paying attention to substitutes for previous products and services that deliver more value for money (Lagace, 2009). In a recession, consumers consume less of many products so this creates a need for substitutes. Many well-known brands have been established during recessionary times such as Texas Instruments, HP, Motorola, Microsoft, Southwest Airlines, JetBlue, MTV, Revlon Cosmetics and Ryanair. As capital is in short supply, investments in start-ups are reduced but great ideas will still be financed when great opportunities are identified. A downturn in one industry can generate low-cost resources that can be acquired and then applied in another industry. Cost cutting and focus on operational efficiencies are the measures commonly used during downturns but sometimes they can impair ability of these companies to be competitive. Thus a need to look at all aspects of a business model that can be improved, not just the cost. With companies scaling back and with the scarcity of capital for launching new ventures, this creates huge possibilities for an entrepreneur to identify new opportunities. When consumer budgets are tight, products that deliver more value for the money have high appeal. The article “Innovation in a Recession”, published in The Economist earlier this year, suggests that economic downturn should coincide with an innovation upturn. As companies face pressure to cut costs across the board, there is a danger that a widespread risk aversion, fear of failure and focus on short-term can work against the culture of bold experimentation required by successful innovation. A downturn can spur companies to greater heights. Innovation appears to be as important as cost reduction in contributing to the ability of many companies to achieve future growth. During a downturn, those that innovate can acquire assets at lower costs that would result in lower cost of product development. Partnerships with universities, innovation partners, suppliers and even customers offer a good opportunity to share costs, spread risks and combine resources. A downturn is prompting a shift of innovation to emerging markets as they offer lower cost R&D and lower cost experimentation but also skilled workforce and better tax environments. These economies, which continue to grow rapidly, while developed countries have fallen into a recession, represent
huge potential markets for global companies. The traditional approach was for companies to come up with new products in their central R&D labs in the West, then adapt them for sale in emerging markets. Increasingly, companies are shifting their R&D efforts to developing countries in order to develop products that are better tailored to local markets. Some companies, like General Electric, take such products and export them back to the West.

Key drivers of radical innovation are: labor, capital, government and corporate culture (Prabhu, 2010). Patents have been widely used as a protection of intellectual property. Companies should make sure that patents lead to commercialization of radically new products. Government drivers of innovation, such as regulation, are not so relevant in a globalized world. Internal corporate culture is the most important driver of radical innovation. The main challenge is how to foster corporate culture that drives innovation even in a recession. Corporate culture refers to a core set of attitudes and practices that are shared by the members of the company. Three attitudes and three practices can help companies foster innovative culture. The attitudes are: a future market orientation (not to remain complacent about a successful past), a willingness to cannibalize existing products and embracing risk. The practices are: empowering product champions, creating internal competition and providing incentives as recognition. Those companies that build the right corporate culture in the face of a recession will emerge as winners in the upturn. Innovation can be fostered by establishing a company-wide process to brainstorm, test and implement ideas, asking customers what they want and need, learning from other industries, testing ideas early on, and developing leaders who are comfortable with risk, who balance passion and objectivity, and command respect (Meyers, 2009).

Innovation can be resource-neutral. It is not just about investment in R&D, but also about building a management practice that is willing to adopt change and reevaluate business processes on a regular basis. A recession is typically a time when a new competitive landscape emerges. This period can be detrimental for some companies, but for those that are well prepared to face a disruptive future it can be the time of great opportunities. From a management perspective, a downturn is a good time to clear “dead wood” from the company’s innovation portfolio. Unpromising projects must be terminated so that company’s resources are spent on critical and promising projects. This can be done by setting clear performance metrics around the successful commercialization of research projects. Chief Technology Officers (CTOs) and heads of R&D must prove that they can lead and motivate their teams at a time when morale may be sagging in response to budget freezes or layoffs. The need to do more with less requires different thinking about the management of innovation. Rather than make big bets on a single, radical innovation, the companies should apply a significant proportion of their resources to adjacent market segments, e.g. taking an existing product to a new customer segment or serving existing customers with a new product. The business model is another area where the companies can innovate: new go-to-market strategies, new distribution, packaging or pricing.
2.3. R&D Investment During Recessions

Per Roberts (2003), in the USA, the term recession refers to general economic downturn lasting two quarters or more. Companies with bold strategies to invest aggressively in marketing, innovation and quality thrive during the market upturn but they also should minimize fixed costs, working capital, manufacturing costs and general and administration expenditures. The decision making process needs to address the short-term needs of the business but it cannot ignore the long-term sustainability of the business. Slashing R&D budgets during a recession might be suicidal (Strategic Direction, 2010).

Continuous improvement of products and services is an essential ingredient of a company’s competitive strategy. Without a stream of incrementally improved and/or totally new products to the markets, companies will stand little chance of survival and growth. Putting innovation investment on hold until “things get better” is not a wise option. The effectiveness of innovations is typically measured on the basis of innovation outputs such as revenue growth, shareholder returns, and brand impact rather than on the basis of innovation inputs such as dedicated people, funds invested and quality of the innovation process. The objective of the front end of the innovation process is to develop a well-defined product concept and a business plan aligned with corporate strategy. Large companies can stimulate their innovation processes by adopting a flexible, fast-moving, small-business attitude towards their customers.

The research study “Profits Down Spending Steady: The Global Innovation 1000” (Jaruzelski and Dehoff, 2009), searched for evidence of whether corporate leaders would continue to invest in R&D, as an essential activity to stay competitive despite negative impacts of the Great Recession or whether they would cut R&D budgets as a short-term way of boosting their economic profits.

The study found that most companies have maintained or increased their R&D spending in 2008 despite the Great Recession. The study was based on 1000 public companies that spent US $532 billion on R&D which was 5.7% more in 2008 than in 2007. This growth was lower than the previous year but in line with the sales growth within the same period of 6.5%. During the same time, the operating income of these companies fell 8.6% and net income by 34%.

Innovation investment is viewed by many companies as essential to corporate strategy and long-term sustainability. As product development cycles extend beyond the duration of an average recession, companies focus on new product launches and less on pure research. Also, companies focus on their development processes and how to get closer to their customers. Weak R&D projects are being discontinued much faster.
Figure 2: Global R&D Spending

Source: OECD, World Bank, International Monetary Fund, and Booz & Company Analysis. Totals are based on Organization for Economic Co-operation and Development (OECD) figures, plus an estimate for non-OECD countries, derived from each country’s gross domestic product and typical R&D spend characteristics of developing countries. Estimates are adjusted to remove the impact of purchasing power parity (PPP) exchange rates and to compensate for double counting.

Not all companies maintained their R&D investment. More than a quarter cut their R&D in 2008. However, the top 100 largest innovation spenders increased their R&D investments by 3.9% in 2008 relative to 2007 but at the same time these companies cut their capital spending by 1%. The recession is seen as an opportunity to become more competitive against those competitors that decide to cut their innovation spending due to financial problems. By investing in innovations during the recession, companies can gain a competitive advantage during the recovery.

R&D spending for the top 20 companies was up 3.2% in 2008. The study did not indicate a direct correlation between the R&D spending and overall corporate performance. Nine out of the top ten R&D spenders in the auto industry cut their R&D investment in 2008. On the other hand, many software and Internet companies invested more in 2008 than in 2007. Health care companies spent the most on R&D as a percent of sales, followed closely by software and Internet companies. The computing and electronics industry spent the most on R&D (US $149 billion) which is 28% of the total spend. Health care was the second with 23% and the auto industry was third with 16%.
### Table 1: The Innovation Top 20 (Source: Booz & Company)

<table>
<thead>
<tr>
<th>Rank</th>
<th>2008</th>
<th>Company</th>
<th>R&amp;D Spending</th>
<th>HQ Location</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>2007</td>
<td>2008 in US$M</td>
<td>Change from 2007</td>
<td>As a % of Sales</td>
<td>Industry</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Toyota</td>
<td>$8,994</td>
<td>-5.7%</td>
<td>4.4%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Nokia</td>
<td>$8,733</td>
<td>5.7%</td>
<td>11.8%</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Roche Holding</td>
<td>$8,168</td>
<td>5.5%</td>
<td>19.4%</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>Microsoft</td>
<td>$8,164</td>
<td>14.6%</td>
<td>13.5%</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>General Motors</td>
<td>$8,000</td>
<td>-1.2%</td>
<td>5.4%</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>Pfizer</td>
<td>$7,945</td>
<td>-1.8%</td>
<td>16.5%</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>Johnson &amp; Johnson</td>
<td>$7,577</td>
<td>-1.3%</td>
<td>11.9%</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>Ford</td>
<td>$7,300</td>
<td>-2.7%</td>
<td>5.0%</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>Novartis</td>
<td>$7,217</td>
<td>12.2%</td>
<td>17.4%</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>Sanofi-Aventis</td>
<td>$6,695</td>
<td>0.8%</td>
<td>16.6%</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>GlaxoSmithKline</td>
<td>$6,425</td>
<td>8.3%</td>
<td>14.4%</td>
</tr>
<tr>
<td>12</td>
<td>9</td>
<td>Samsung</td>
<td>$6,413</td>
<td>16.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>IBM</td>
<td>$6,337</td>
<td>3.0%</td>
<td>6.1%</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>Intel</td>
<td>$5,722</td>
<td>-0.6%</td>
<td>15.2%</td>
</tr>
<tr>
<td>15</td>
<td>21</td>
<td>Siemens</td>
<td>$5,680</td>
<td>11.3%</td>
<td>4.9%</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>Honda</td>
<td>$5,603</td>
<td>-4.2%</td>
<td>5.6%</td>
</tr>
<tr>
<td>17</td>
<td>19</td>
<td>Volkswagen</td>
<td>$5,429</td>
<td>6.7%</td>
<td>3.3%</td>
</tr>
<tr>
<td>18</td>
<td>15</td>
<td>AstraZeneca</td>
<td>$5,179</td>
<td>0.3%</td>
<td>16.4%</td>
</tr>
<tr>
<td>19</td>
<td>22</td>
<td>Cisco Systems</td>
<td>$5,153</td>
<td>14.5%</td>
<td>13.0%</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>Panasonic</td>
<td>$5,152</td>
<td>-6.6%</td>
<td>6.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>$135,886</td>
<td>3.2%</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

### Figure 3: Innovation Spending by Industry

**Innovation Spending by Industry in US$ billion (Total US $532B)**

Source: Booz & Company
Based on a survey of 290 senior executives and R&D leaders, 70% of them were planning to either maintain or increase the R&D investment in 2009. The recession has stimulated innovation by forcing management to think more carefully about new product developments, engineering processes and costs.

Multinational companies are spending a growing share of their R&D investment outside of their home countries (Jaruzelski and Dehoff, 2008). Companies that invest globally in innovations are gaining better returns on their R&D investment than companies that invest only at home. The Global Innovation 1000 companies are spending an average of 55% of their R&D outside their home country. Large companies have been globalizing their R&D for many years. Just between 2005 and 2007, global corporations increased their R&D staff by 22% and 91% of that increase was in India and China.

Multinationals are investing their R&D money abroad for several reasons:

- Lower costs. Initial objective was to save money by replacing higher-paid “home country” engineers with lower-paid engineers in developing countries. As wage rates in these countries are increasing, the savings are getting smaller.

- Access to talent. The number of skilled engineers is increasing rapidly in developing countries. Various countries are gaining specific skills such as automotive engineering, software and pharmaceutical R&D in India, and electronics R&D in China.

- Market proximity. Competitive landscape is characterized by the rise of rapidly developing economies such as China and India, globalization of suppliers and competitors, growth of information and telecommunication technologies, the concerns about climate change and environmental sustainability and growing geopolitical risks and tensions. New markets cannot afford expensive products from developed countries but they are still looking for high-quality, low-cost products built for their own environment. The companies that understand local customer needs are more profitable than the companies whose R&D footprint is more global than their sales footprint.

Companies need to develop R&D strategies that are fully aligned with their overall corporate strategies and in sync with local conditions in which they operate. A network of fewer but larger R&D facilities seems to support stronger performance results. This approach has better use of resources, improved communication and collaboration, larger economies of scale and economies of learning.
3. **Hypotheses**

A hypothesis is a tentative statement that attempts to explain a research question. Two hypotheses in this section are the statements about two research questions raised at the beginning of this paper.

1. Companies continue to invest in research and development during a recession at a reduced level in line with their revenue and in those projects that have the highest possible short-term (within 6 to 12 months) return on investment.
2. Companies do not spend time and effort to learn from previous recessions as external environments change from one recession to the next one.

These hypotheses are potentially testable. The data from the research study may support or not support each of the two research hypotheses.

4. **Methodology**

This applied project paper is a conceptual paper based on secondary sources of data from literature that covers the relationship between innovation and recessions as part of the strategic planning process. These secondary sources of data are used in the analysis to support or not to support two main hypotheses. This paper includes a literature review on the topic of companies' investment in innovation during economic downturns and is based on the evidence collected from existing articles and books.

The key search words that are used in the systematic literature search on the Internet through the Google search engine are: innovation, recession, strategy, research and development, investment, and globalization. The timeframe that literature, used for this applied project, covers is the past 15 years. The paper does not use primary data i.e. interviews or surveys. It does use publically available secondary data. The research design used in this research is based on collected data from literature that relate to stated research problems.

The data are logically organized and then analyzed and interpreted to determine their meaning in relation to the research problems. Literature that is outlined in the review includes numeric data on R&D spending of large samples of the companies across the world. The information is public as the largest R&D spenders are public companies. This research communicates its findings through numbers and aggregated data from literature, publicly available corporate documents, articles and reports. The information is presented in charts and tables in addition to textual interpretation of these results but the results do not include any interview notes.

The analysis outlines the relationship between various concepts, models and frameworks that relate to innovations in recessionary times. The paper reflects on the data collected during the past recessions that is publicly available within the references. This applied project also includes various concepts, models and
frameworks that relate to innovation not just on the technological side but in all other aspects of a business. I am not using any data that relate to Christie Digital Systems. Therefore, I do not require a corporate approval from Christie relative to this applied project. Although this is not a scientific paper, it will follow scientific logic based on the existing sources of information.

5. Results / Discussion

The results and discussion section presents the actual analysis of two hypotheses that are related to two research questions. As every product and industry have their lifecycles, companies also have their own that include four stages: introduction, growth, maturity and decline. Companies are established by entrepreneurs in order to commercialize their ideas. After the growth stage, companies mature in their industries and if they have hard time continuing to grow they decline and eventually disappear. Companies experience various rates of innovations throughout the stages of their lifecycles. Companies innovate during the introduction stage as new products and technologies are launched. During the growth stage innovations shift from the products to processes as companies look for ways to reduce production costs. Process innovations take place after product innovations (Grant, 2008). When companies stop growing organically and reach the maturity stage, customers look for replacement products. Those companies that invest in new replacement product developments while still enjoying economic profits from the existing products are positioned well for future growth. In the decline stage, companies innovate to avoid a danger of going out of business. Companies cannot maintain long-term sustainability if they don’t innovate throughout the good and bad times and throughout all stages of their lifecycles. Without new products that can satisfy customer needs in a better, faster, less expensive or simpler way than the competitive products, companies cannot expect to continue to grow. New products are created through innovations and the level of the R&D investment changes over time due to profitability levels of companies and the impact of macroeconomic conditions on the market. Companies know that they need to innovate as they will be left behind if they don’t. It is easy to spend money on R&D investments during the times of economic prosperity but it becomes much more challenging during recessions. These times of economic decline change the way how companies prioritize their R&D projects through their resource-allocation process.

5.1. Hypothesis #1

The first hypothesis states that companies continue to invest in innovations during recessions but at a reduced level and in line with their revenue. They pull back on the R&D investment and focus on those projects that have the highest possible short-term (within 6 to 12 months) return on that investment.
5.1.1. Innovation Process

As per Grant (2008), invention is the creation of new products and processes through the development of new knowledge or from new combination and application of existing knowledge. On the other hand, innovation is the initial commercialization of invention by producing and marketing a new product or service or by using a new method of production.

The following figure depicts the development of technology from basic knowledge to diffusion.

**Figure 4: Innovation Process**

![Innovation Process Diagram]

The first step in the innovation process is the creation of basic knowledge that is transformed into invention and then when commercialized through innovation is diffused on the supply side by competitors who imitate the product and on the demand side by customers who purchase and adopt the product (Grant, 2008).

Innovation creates a competitive advantage and the value to companies that create innovation. Other players in the value chain such as suppliers and customers also derive value from innovation. Return on investment generated by innovation depends on the barriers to imitation that a company establishes with intellectual property rights, complexity of innovation, amount of head start time and resources that are required to finance, design, manufacture, and sell the new product. Intellectual property rights are protected at different levels through patents, copyrights, trademarks and trade secrets, however patents are public information so companies may choose to keep their innovations secret instead of patenting them. The value of patents can be significant through the royalties paid to patent owners. More complex innovation is, less likely a competitor will be able to copy it and more profits will stay with a company.

A company with innovation has the first-mover competitive advantage so it can establish a leadership position and maximize its profits before competitors create an imitation. The complexity and sophistication of innovation determine the barriers to imitate.
5.1.2. Basic Framework of Strategic Analysis

Strategy is a link between internal and external environments (Grant, 2008). Within this basic framework of strategic analysis, the internal environment is characterized by a company’s goals and values, resources and capabilities, and structures and systems. The external environment defines the environment within which a company operates and its relationships with customers, suppliers and competitors. Strategy is a longer-term plan that defines how an organization will deploy its resources and capabilities into the external environment to achieve its goals and objectives. The SWOT analysis attempts to identify strengths and weaknesses of the company’s internal environment, and opportunities and threats that exist within the company’s external environment. A challenging side of the SWOT analysis is that, depending on a point of view, an element of the internal environment can be perceived as a strength or as a weakness. The same applies to the external environment as a threat can also be viewed as an opportunity. Successful strategies are those that are aligned with the company’s resources and capabilities and with its external environment. As the external environment becomes more uncertain and unstable, driven by ongoing changes on a global basis, a clear direction where a company is going is essential. The primary objective of a company is to survive and grow long-term. This can be achieved only when a rate of return on its capital exceeds its cost of capital (Grant, 2008). There are two levels of strategy: corporate strategy and business strategy. Corporate strategy defines in which industry and markets the company competes. This strategy is typically a domain of top management. At a level below, business strategy defines how the company competes in the markets identified by corporate strategy. Mid-level management defines the ways how the company goes to market and how it competes within the markets chosen by senior executives. Any company has to have a competitive advantage over its rivals to be able to generate economic profit.

Strategy formulation cannot be separated from strategy implementation. Strategy formulation needs to take in account organization’s innovation process and how innovations are commercialized. The outputs of the innovation R&D process in a company depends on organizational conditions that stimulate innovations. The conditions are based on cooperation and collaboration between engineering, manufacturing, marketing, quality and other functions within a company. The creativity of individuals depends on the internal organizational environment. Creative people have strong imagination and curiosity about technology and business and the creativity is stimulated by human interaction in experimenting with the concepts and objects. The costs of experimentation are reduced through the use of computers in modeling and simulation as well as rapid prototyping and virtual reality. By investing in these new technologies, companies can reduce their R&D investments and at the same time increase productivity of the innovation process as well as decrease the development cycle of new products and services. A culture of creative freedom allows challenging the status quo. It is very important that creativity is encouraged and not interfered with. Involving
customers in the R&D process is the best link between the creative process and the market needs. Also, companies may involve suppliers and even competitors in this process. Innovative organizations have a less formal internal structure and stronger links between internal and external stakeholders in order to foster a better flow of ideas. The stakeholders form a network of collaboration. Creative organizations are flat organizations with flexible organizational boundaries in terms of strategic planning and financial control. Managers act as sponsors of generation of ideas. Creative people respond to the environments that are egalitarian, spontaneous, open to fun and with continuous investment in education and professional growth.

5.1.3. Five Forces Industry Analysis

The Five Forces industry analysis is a widely used framework, developed by Michael Porter of Harvard Business School, for analyzing five competitive forces that define the external environment. The framework can be used for the analysis of companies' behavior regarding innovation during recessions.

Figure 5: Porter's Five Forces of Competition Framework

Typically, there are many competitors in mature industries from the low end of the market to the very high end. It is also referred to as industry rivalry among existing companies. Globalization increases diversity of competitors as well as customers. Michael Porter has defined three generic business strategies: cost leadership, differentiation and focus. Innovation can be applied to cost advantage (e.g. innovation of manufacturing process, outsourcing or new distribution models) and differentiation strategies (i.e. innovation in products and services). Differentiation goes beyond attributes of the product or service that drives the value for customers. Every aspect of the company’s interaction with customers is subject to potential differentiation. Status, image, quality, exclusivity, individuality, social, emotional and esthetic considerations are the elements that define customers’ choice of products and services. All these dimensions are opportunities for differentiation.
Innovations create competitive advantages and higher the barriers to imitation by competitors, higher the value a company can extract from them. The companies that base their competitiveness on differentiation typically compete at the high end of the market against fewer competitors. The low end of the market is usually crowded by many players who are competing on price due to very limited product differentiation. During a recession, a balance between demand and supply capacity gets disrupted. Every recession is characterized by declining demand. An orderly adjustment of a company’s capacity to declining demand is the key to stability and profitability during a recession. This adjustment depends on the predictability of decline, barriers to exit of extra capacity (plant closure costs, management unwillingness to accept the new realities), and the industry dynamics in terms of mergers and acquisitions. As demand declines, unused capacity drives the prices down in a company’s effort to attract more business in order to spread fixed costs over a greater sales volume. This also drives down the company’s profitability. If barriers to exit of excess capacity that wants to leave an industry are too high, then the impact on profitability is very large. Commercialization of innovations through new products can reduce the amount of excess capacity caused by a recession. This spreads fixed manufacturing costs over a broader range of products and higher sales volume.

When companies in an industry earn high economic profits, that industry becomes attractive to new entrants. A barrier to entry is any advantage that established companies in an industry have over new entrants. If barriers to entry are low then economic profit will decline as the competition increases. Globalization reduces the levels of barriers to entry through tariff reductions, lower cost of transportation and logistics and internationalization of standards. Capital requirements vary across an industry. Typically they are small at the low end of the market and large at the high end of the market. At the low end, the products are very similar to each other, with no differentiation, so the competition is engaged in price wars. Innovation in operational processes that improve operational efficiencies can provide a competitive advantage at the cost level. Competitors that do not innovate in their operations count on large economies of scale to make economic profit. At the high end of the market, the products are highly differentiated due to significant R&D and capital investments. Continuous product innovations can further differentiate mature products and secure higher levels of profit even in a recession. Differentiation needs to be focused on satisfying changed customer needs and priorities. Innovation that does not translate into this type of differentiation will not generate additional profit. New entrants may look for different distribution models such as the Internet to gain their foothold in an industry. The entrants that bring to the market disruptive and innovative technologies at the lower end of the market have better chance to compete against the incumbents. The entrants that use sustaining innovation against established incumbents in an effort to take away their most profitable customers face strong retaliation by the incumbents (Christensen, Raynor, 2003).
Market availability of **substitutes** defines what price customers are willing to pay for a product or service. If close substitutes exist then customers are sensitive to price as demand is more elastic with respect to price and vice versa. Product innovation that can separate a company's product from competitive products and substitutes decreases the elasticity of demand relative to price so it is less likely that a price increase will drive customers towards substitutes.

A value chain analysis can be performed by using Michael Porter’s model of the value chain that distinguish between primary and support activities within the chain. Primary activities are inbound logistics, operations, outbound logistics, sales and marketing and service. Support activities are company’s infrastructure, human resource management, technology development and procurement (Grant, 2008).

There are two sources of vertical competition in an industry: **power of buyers** and power of suppliers. When a product or service is sold to a customer, a company creates value not only for the buyer and for itself but also for its suppliers. How this newly created value is shared between suppliers, the company and buyers depends on their relative bargaining power. An industry with few buyers that make large purchases means that a company will have a higher cost of losing any given buyer, so buyer concentration lowers prices and profits in the supplying industry. The more information buyers have about suppliers’ costs, the more negotiation power they gain and that helps them to bargain harder and drive prices down. Innovations that hide the costs of the products so they are not easily identified by buyers increase economic profit of the supplier. Innovations also move the products up the market, where there is a limited choice of high quality products and therefore the buyer power is limited. Profitability levels at the high end of an industry are more attractive as they are driven by the ability of manufacturers to continuously innovate and differentiate.

The analysis of **power of suppliers** is analogous to the analysis of power of buyers as the relationship is reversed. A company is a buyer of the inputs provided by its suppliers. If the company can easily switch from one supplier to another then the bargaining power of suppliers is not high. Commodity suppliers lack bargaining power unless they organize themselves in cartels to protect their prices. Suppliers who offer complex and innovative parts and components exert higher bargaining power than those who don’t.

### 5.1.4. Resources and Capabilities

In addition to a company’s position relative to the external environment, strategy includes the analysis of the company’s internal environment. During recessions, the external environment is unstable and uncertain, so companies look for internal resources and capabilities as sources of profitability based on competitive advantages and a more stable base for strategy formulation and directions. An organizational capability is a company’s capacity to deploy resources to achieve its objective. Commercialization of innovations require resources and capabilities across the organization that connect creativity and
technological knowledge to organizational functions such as logistics, operations, sales and marketing as well as customer service and support. These resources and capabilities, owned by a company, determine the levels of barriers to entry (financial and physical resources, patents, brands, knowledge, know-how skills etc.) within Porter’s five forces framework.

The people are the most valuable assets of any organization. Strategic management of human capital is essential in meeting strategic needs of companies. Every company needs talents to innovate and commercialize new products. Strategic human resources are the base for successful innovations. Cross-functional product development teams are used to integrate various functional capabilities in order to develop new products. These teams enable better communication and collaboration across various functions. Product champions are individuals who are not only behind innovations as creative forces but also they are an integral part of the process of commercialization. They transform new product ideas into new business opportunities. Startup companies have advantages in early stages of the innovation process and large corporations gain access to them through acquisitions. Another way to stimulate the innovation process is through the incubation of small business units that are focused on new product development. This is especially effective if it is done while the core business is still strong.

Mature companies have the innovation process fully established. As a recession puts pressure on cash flow, these companies shift their focus away from basic research and basic knowledge to the steps in the process that can transform inventions into innovations faster so new products, technologies, services, business processes and models can be diffused within a shorter period of time so the return on that investment is faster. When companies do not focus as much on basic research, that typically means that the overall R&D investment is reduced relative to the times when this investment included basic research. Based on the fact that recessions last between 6 and 16 months, the main focus is on the R&D projects and associated innovations that can be diffused during a recession or closer to the time when the economic recovery starts. This analysis, based on Grant’s model of the innovation process, and the data from the literature review supports the first hypothesis that companies continue to invest in R&D during recessionary times but focus on a reduced level of investment and on those innovations that deliver short-term return on investment. Whether the analysis focuses on the internal or external environment of a company, innovation and its commercialization during recessionary times is the way to protect the company’s profitability and generate sustainable competitive advantages over its competitors. Innovations increase bargaining power of innovators and increase barriers to entry. Innovations provide uniqueness and a company can find opportunities for uniqueness in anything it does.

Strategic innovations create value for customers from new experiences, new product features, services, new marketing programs, manufacturing and other
business processes, quality, reliability, expertise of employees, management and
business models.

5.2. **Hypothesis #2**

The second hypothesis states that companies do not spend time and effort to
learn from previous recessions as the external environment changes from one
recession to the next one.

5.2.1. **Previous Recessions**

Although the causes of each recession are different, there is a number of
common attributes such as economic decline, financial difficulties, higher
unemployment and changing customer priorities. The external environment is
characterized by its complexity and global interdependencies. As new
communication technologies rapidly develop, it is becoming increasingly evident
that the world is getting "smaller" but increasingly more complex. Companies,
both large and small, compete on a global basis whether they want it or not.
Innovations developed by a company on the other side of the world quickly
become a part of the competitive environment regardless of its place in the world.
Some of previous recessions were contained within the national borders or
regions, but the most recent ones have truly a global character. The
interdependencies are so significant that a source of a recession can reside in
one part, but a solution can be found in another part of the world. Our
experiences are defined by the changes that are rapid and extensive, employees
have the same access to the information as their managers so the decision
making process cannot be contained only in the "all-knowledgeable"
management circles, job security is a thing of the past, global competition
increases all the time as suppliers and customers open new distribution channels
and markets. Social media networking has dramatically increased the amount of
information shared between individuals and companies. Customers gain more
knowledge about the products and in that process they become more price
sensitive as they easily compare one product to another. The impact of the
Internet on customers and their selection of products and services is very
significant. Customers can easily find the comments from other users regarding
their experiences with quality and performance of various products.

The external environment is changing so fast on a global basis that companies
don't have time to spend learning from previous recessions. Each recession in
the past has generated a number of innovations that had profound impact on the
world. For more than a century, recessions have been the times of increased
focus on economic survival and renewal. Each recession was characterized by a
sense of urgency to reduce waste and stimulate growth. Recessions do not last
as long as the times of economic prosperity so the companies with short
memories do not learn from them as their opportunities to improve.
5.2.2. Corporation as Living Organism

Organizations use their resources and capabilities to deliver on their mission and vision. The strategic focus of a company depends on the alignment of corporate functions along the value chain. Does this alignment create an organizational structure and processes that are not open to change? Over time, as companies grow, the organizational structure becomes more mechanistic and rigid. Relationships between various organizational functions tend to create a state of equilibrium and inertia that minimizes the variation within the processes. Companies design their organizational structures and processes with a goal to minimize disruptions and variations. This creates a more rigid and hierarchical structure that wants to control the flow of information. This type of an organizational structure inherently opposes creativity and distributed decision making.

The main problem with this model is that organizations are not machines but they consist of people who, as other biological organisms, perform the best under an optimal level of conflict and stress that is opposite to the state of equilibrium. This means that economic survival of a company as a “living organism” depends on the management ability to avoid the equilibrium state and not allow the company to become complacent within their internal environment (Youngblood, 1997). The management challenge is to stimulate internal disruptions that create a disequilibrium state as a fertile ground for innovations. It is a part of economic survival of the fittest in evolution of business models within the external environment. Change is difficult to manage for individuals and even more for organizations as it disrupts organizational routines and already established interactions among organizational functions. Companies with highly developed organizational processes have harder time to change them. The effectiveness of business strategy depends on the alignment of internal functions relative to the external environment. If a change impacts one function, then all functions have to change to regain their mutual alignment. If a change threatens the power of the management, they will resist it. One of the reasons why a change fails to take place is that senior executives tend to exempt themselves from the rules that govern the rest of the organization. Employees will imitate what the executives do and not what they say. Walking the talk and taking responsibility for one’s own behavior is a cornerstone of the organization that is capable of change.

5.2.3. Strategic Innovations

Is there a way to artificially create a state of a recession to stimulate innovation even during the times of economic prosperity? How do we get companies into that state? How to “disrupt” their inertia?

The first step would be for management to identify sources of inertia. Once these rigidities are recognized, a company can initiate a strategic change. The challenge for top management is to undertake change before the company is pressured to change by its declining performance. In order to stimulate
innovations even during the times of economic prosperity, the corporate leadership has to create a state of dissatisfaction with the status quo. This requires that top management creates a perception of imminent crises (recession) within a company. One option is to create smaller and separate business units that are aligned with corporate strategy but are left on their own to survive without being slowed down by the corporate mechanistic nature. A decentralized company can pursue disruptive innovations for longer than can a monolithic, centralized one, because the size that a new disruptive venture must reach to make a difference to a small business unit is more consistent with the revenue ramp of a new disruptive business. The managers of a monolithic $1 billion company that needs to grow 15% annually will look at every proposed innovation from the perspective of needing to find $150 million in new revenues over the previous year’s revenue. If a $1 billion dollar company consists of 10 business units, the average perspective of these ten business managers in a decentralized company, in contrast, is that they need to bring in $15 million of new revenue. In a company that consists of multiple business units, there are more managers seeking disruptive growth opportunities, and more opportunities will look attractive to them.

Most of the companies that have transformed themselves over the last few decades, companies such as Hewlett-Packard, Johnson & Johnson, and General Electric, have been composed of a large number of smaller, autonomous business units. These companies have not transformed themselves by transforming the business models of their existing business units into disruptive growth businesses but by creating new disruptive business units and by shutting down or selling off mature business units that had reached the feasible end of their sustaining technology trajectories (Christensen, Raynor, 2003). Finance people will argue that redundant overhead expenses can be eliminated when business units are consolidated into much larger entities. They rarely assess the impact that consolidation has on consequent demands in those mega-units that any new business that is launched must get very big very fast. This would cram disruptive technology into an established market and this approach will fail as the incumbents will choose to fight and protect their most profitable market.

Management should demand early success and profit of the new business units and minimize the use of profit from established businesses to subsidize losses in new growth businesses. This approach helps accelerate the emergent strategy process by demanding from a new business unit to quickly test their assumptions that there are customers who will buy their products. Also, forcing a new business unit to become profitable as soon as feasible helps to protect it from being shut down when the core business declines in terms of profitability. When that happens, the core business requires all of corporation’s resources to recover. When a recession occurs, new growth business units that cannot play an immediate role in returning the core corporation to financial health simply get sacrificed, even though everybody knows that they are cutting their future in order to salvage the present. The need to survive takes the highest priority.
When the core corporation starts losing money, the new business unit in order to survive needs to be profitable enough that the corporate bottom line looks worse without the new business unit. At that point, the new venture becomes a part of the solution to the financial problems of the core corporation.

### 5.2.4. Role of Senior Executives

One of the theories of when senior executives should get involved and when they should not is based on the magnitude of money at stake. Lower-level managers can make small decisions but only senior executives can make big money decisions. Sometimes this theory accurately predicts the quality of decisions but sometimes it does not. Sometimes senior executives do not know what questions to ask as they typically do not know much beyond what the managers below choose to tell them. Mid-level managers learn over time what the numbers must look like for senior executives to approve new proposals, and they also learn what information ought not be presented in order to get an approval. Initiatives that do not make sense to mid-level managers do not get in front of senior executives. In these cases, senior executives think they are making big decisions but they actually are not. Decision making processes that work well without the attention of senior executives are in circumstances of sustaining innovation. The mainstream processes that manage sustaining innovations are already in place and less senior executive involvement is needed so they can delegate their tasks to others. As companies do not have mainstream processes to manage decision making in circumstances of disruptive innovations, that’s when the involvement of senior executives is mandatory. Executives must be well versed in disruptive innovation theory and should be able to separate disruptive ideas from sustaining innovations. Once disruptive ideas are identified, the job of senior executives is to ensure that these ideas are fed into a process that maximizes their chances of success. Senior executives determine when new processes need to be created to support new disruptive businesses. This executive role changes over time. Early on, senior executives monitor and coach individual decisions in new growth businesses. Later on, they monitor the process for collecting, shaping and funding ideas as well as monitor changing circumstances in the company’s environment. The main problem that prevents companies from creating a growth engine that sustains a company’s growth for an extended period of time is that disruptive ideas often lose their disruptive growth potential in the decision making process that they go through in order to get funded. Senior executives need to create a separate operating process through which these ideas can be shaped into high-potential disruptions. This needs to become a recurrent task. Managers must control the initial cost structure of a new business, actively accelerate the process that enables a viable strategy to emerge, and personally get involved in defining whether the business should follow an emergent or deliberate strategy making process.
5.2.5. Centralized vs. Decentralized Organizational Structure

Although businesses are living systems, traditional business tools are designed to deal with business problems as they are machines as we spend our efforts to force control onto the organization. Bureaucracy is conducive to efficiency in stable environments but centralized structures cannot readily adapt to change. Greater decentralization is required to respond to external changes and for a company to become more flexible. Centralized control and supervision hinders innovation.

Increasingly, people are looking at Nature to find solutions for the challenges of the modern world. Centralized control of the living systems would be a sure path to extinction as Nature and its complex adaptive systems have order instead of control. These systems operate between too much and too little structure. With too much structure they become rigid and complacent to the environmental changes. With too little structure they become too sensitive to the changes and eventually disintegrate. When natural systems reach critical levels of instability and operate far from equilibrium but not chaotically, they creatively self-organize into higher levels of order that are more complex and more stable (Youngblood, 1997).

New business units need to have all elements required to operate and as a system are much more than a sum of its individual components. As all living organisms have to have all its major parts to survive and prosper, so do the business units. A business unit must have all primary functions in the value chain within the business unit and under its own discretion. These functions need to be connected in a way that one cannot establish the causes and effects. These complex interconnections enable the company to create new levels of order. People within these business units need to freely interact with their internal and external environment by sharing the information. Organizational structure has to promote diversity and flexibility so the processes are continuously adapted to the changes in environmental conditions. Each living organism has a strong unifying identity despite their internal diversity. The actions of people within the organizations need to be in sync with the overall purpose of the organization as organizational survival is of the paramount importance.

Successful organizations look for ways to optimize and balance their dynamic elements. Companies achieve their greatness through this optimization of all elements and not by maximization of any given attribute. Management can use scenario analysis in their effort to anticipate changes in the external environment. It is a technique that stimulates thinking about how the future might unfold relative to industry evolution, changing customer needs and priorities, emerging technologies and new competitive strategies. The main value of scenario analysis is in its process as it brings different ideas to the surface, challenges the business assumptions, generate strategic options, and identifies threats and opportunities. It is critical that a company has an internal mechanism to not only
deal with the externally induced change but to also internally generate change in anticipation of future changes in the industry. Those who initiate change have competitive advantages over those who simply react and adapt to the changes in the external environment. A company’s ability to change its own internal organizational routines, systems and structures that restrict innovation is critical for survival. If this is done not just in a recession but in anticipation of one or even in artificially created state of recession is a significant advantage. This needs to be handled very carefully as radical strategic changes carry major risks if a company moves beyond its competence domain. The pursuit of strategic innovation requires an entrepreneurial organization with freedom to experiment and the capacity to learn from its own and others’ mistakes. This requires that top management loses its monopoly over strategy formulation and that other people from the frontlines of the organization get involved in the strategy making process.

5.2.6. Organizational Learning

Bureaucratic organizations tend to maximize efficiency but at the cost of adaptability and flexibility. These organizations typically cut continuing education and learning. Learning is a core competence that is critical for the long-term success of any company. Companies that do not value learning will not invest in continuing education and those that stop learning will stop being competitive. Learning is different from training. Training treats the employees as students that are on the receiving end of teaching that is already predefined so the employees don’t have a choice what they are trained on. Education is fundamentally not about teaching but about learning where the employees determine what and how they learn. Continuing education is what stimulates the innovation process and creates new competitive advantages long-term.

The analysis and the data from the research study support the second hypothesis.

6. Conclusion

6.1. Summary

This paper searches for an answer to the questions of innovation management during recessions. All companies are aware of a need to innovate to survive as viable businesses but many of them struggle with the ways how to do it during the times of financial difficulties. Research shows that most companies continue to make R&D investments although on a smaller scale. Also, companies look for ways to eliminate wasteful R&D projects and to improve their innovation processes to achieve higher effectiveness and efficiency. Companies look for a short-term return on their R&D investments.
Globalization driven by dramatic changes in telecommunication, information technologies and logistics increase the competition but also increase the company’s access to global customers. The Industrial Age organizational structure was designed to exercise command and control over organizational functions, information and human resources. This mechanistic and bureaucratic approach to the organizational internal environment is not suitable for the new Information Age of the 21st century. This traditional organizational design hinders innovation and imposes barriers to the flow of information within the organization for the sake of higher efficiency and large economies of scale.

The rate of change in the external environment is faster than ever before. This puts a lot of pressure on the organization to change in order to survive. Different organizational structures and systems are required to not only respond to external changes but also to anticipate them before they take place. Companies need to be open, flexible, and willing to continuously learn from an unrestricted flow of information throughout the organization.

Strategic innovation goes beyond the development of new products and services and requires a change in all aspects of the company’s interactions with customers who are becoming more knowledgeable about the products, more sophisticated and therefore more price sensitive. This increasing bargaining power of customers impacts the profitability of companies but innovations can protect that profitability and at the same time create new value for customers.

Recessions are not the times to stop creating this new value, quite opposite. Those are exactly the times when companies can become leaders by providing more valuable customer experiences and taking the market share away from their competitors. Recessions are not something to fear as they represent great opportunities for the companies that are agile and entrepreneurial. The role of human resources is critical as companies look for ways to protect their talents and intellectual property. Human capital is essential for the innovation process. There is no successful innovation process without creative and courageous individuals who are willing to take risks and able to change within new environmental conditions. The organizational system needs to be open to the external environment to be able to collect the information from that environment and then respond to it. Great companies continuously look for ways to adapt to the changes and optimize their internal processes in their response to changing customers’ needs. Learning from past recessions is a way to improve the chances of economic survival.

6.2. Shortcomings

The shortcomings of this paper are that it is based only on secondary sources. As companies need to foster diversity that stimulates the flow of information so does the research on innovation in a recession. Most companies implement similar organizational structures and systems but the strength of the economy is
in its diversification. As the economy moves through its cycles of upturns and downturns, management has unique responsibilities in terms of addressing the challenges of environmental changes. The role of corporate and personal leadership is critical and this paper does not address this element in depth. Another shortcoming of this paper is the analysis of the impact of globalization on the way companies approach innovation. As the buying power of customers in developing countries increases, it has an impact on how new products and services are developed and sold. The local customer requirements place new challenges on global corporations in terms of their cost management as well as product differentiation.

6.3. Implications for Managers

The implications for the managers who would read this paper are to encourage them to look for unique and different ways of achieving their strategic objectives even during the times when economic decline questions the very survival of their organizations. These times can be a blessing if they are used to move companies away from the state of inertia and equilibrium. These managers cannot afford to neglect the overall strategic direction of their company despite their intense focus on details related to the attributes of a recession. As these managers complement other employees within the same organization, their challenge is to balance the interests of various parties within the organization without jeopardizing the core mission of the company. It is inevitable that companies will face new recessions in the future but senior managers do not need to wait until these recessions hit their companies to make necessary changes. If they decide to stimulate changes by refusing to accept status quo, then their companies will not only be more successful during good times but will better navigate recession storms too.

6.4. Suggestions for Future Research

Suggestions for future research include further investigation into the ways that complex systems behave during the times of peril. The extinction of living organisms is caused by their inability to cope with environmental changes. As every company represents a living organism, the same would apply to them. The challenge is how to develop organizations so they can cope with these changes. There is not any predetermined way of dealing with recessions despite all knowledge acquired from the previous ones. There are guidelines or suggestions regarding innovation strategies but the main objective is to develop an organization that will thrive on the changes and is not paralyzed by them in its environments. One thing for sure, the rate of change will only increase moving forward and the complexity of the more interconnected world will continue to increase the amount of stress within business organizations. How they deal with these changes, positive and negative, will determine their survival. Future research of the role of management in leading organizations during recessions would be beneficial.
7. References


