

The Future CIO: From Computer Scientist to Visual Artist

by

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Abstract

The idea for this MRP was developed with the knowledge that technology is rapidly advancing along with it, information technology leadership needs to adapt as well. Many articles have been written on the need for enhanced IT leadership but remain focused on elements such as team development, communication and corporate partnership. After reading several articles I felt information was lacking on more drastic needs of IT leadership evolution. Through literature reviews an assessment of the current trajectory of the CIO in comparison with the Canadian economy highlighted a gap between trajectory and expectations. A series of CIO interviews were conducted to research further into the priorities of the Canadian CIO in six industries; Finance, Retail, Construction, Transportation, Healthcare and Manufacturing. These interviews were also designed to understand existing technological challenges and future concerns. The output of the research conducted was the Canadian CIO needs to change more aggressively to meet the changing technological environment. The Canadian CIO needs to become much more creative and innovative to meet the challenges of global competition.

Dedicated to Kian, Niamh & Tadhg

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Introduction

The technological world is evolving at a rapid pace. New breakthroughs are happening at rate never seen before in the modern world. The Internet of Things (IoT), wearable technology and vehicle on-board computing are pushing several industries towards new levels of intelligence and productivity. These are just a few examples of new technology changing the technical environment for Canadian companies. This evolution of technology isn't stopping, it is increasing at a very fast pace. New advancements are available for organizations that improve the customer experience, give competitive advantage and drive new levels of profitability. Technology has become a differentiator in many industries (Coleman, 2014).

These new advancements come with a host of issues and challenges that will affect businesses. With a growing set of commercially available technological solutions, business leadership will be challenged with ensuring the investments they make meet the needs of the stakeholders while realizing social and environmental stakeholder value and not simply investing for the sake of the latest gadgets. The change management involved in new technology will be significant especially for an aging workforce. Ensuring the technology fits into a broader strategic vision and evolution of the organization will be a complex and intellectually challenging problem. Budgeting and funding of new technology will also be an issue; the changing environment and changing paradigms will challenge our old concepts of return on investment (Evans, 2014). Other issues will include the smaller depreciation cycles of technology and a continual need for reinvestment.

These rapid advancements will push the boundaries of typical business practices. Corporations will need to develop flexible environments to support the new advancements if they want to take advantage of the changing landscape. This level of strategic foresight has eluded many IT leaders in several sectors across the Canadian landscape (ICTC, 2013).

The rate of technological evolution is working faster than business evolution. Companies started in the nineteen thirties had a lifespan of up to seventy five years. Today a company typically lasts approximately fifteen years. This is a symptom of corporate adaptability to a fast technological shift juxtaposed with the economic cycle of a longer depreciation cycle on technology. In this environment a company's ability to adapt to new technology to offer new value is key to survival (Hooper, 2017). Several Canadian industries lag internationally in technological advancements today especially in the small to medium business sector. Adoption for these companies is a challenge putting them at a disadvantage in the global marketplace. As technological change advances, Canadian business is fighting on two fronts, to catch up to their international competition and adopt new technologies at a faster rate (ICTC, 2013).

With these factors Canadian business needs a paradigm shift on technological adoption and new technology integration. This shift needs to take place with the information technology (IT) leadership, being more receptive to new investments, elevated communication, exceptional change management and superior people development. IT leaders need to move past the information technologist and evolve to meet the new and changing modern technological reality (SpenceStuart, 2005). CIOs need to move from computer scientist to visual artist in an effort to adapt to the changing technological world.

The role of the IT leader no longer influences a small region of their organization; it now spans across many departments touching almost every corner of the company. This puts increasing pressure on the IT leader to think differently. Modern CIOs need to collaborate; they need to communicate and they need to lead teams that can drive results across an entire corporate platform. This puts a spotlight on the modern CIO as a strategist and extroverted engaging corporate leader. This is seemingly similar to the Chief Financial Officer (CFO), who needs to help set and manage budgets for all area of the organization. The CIO is different. The modern CIO needs to take on another role which includes a large focus on creativity, innovation and empathy while taking seemingly unrelated technologies and

integrating them together to create a composite solution. With the technological landscape as their canvas, the CIO needs to engage with stakeholders on an emotional level while providing new and innovative solutions that bring a uniqueness to their branding thereby ensuring corporate relevance.

With the commoditization of IT, which is the ability to buy specialized services for short, medium or long term initiatives from a third party, there is no longer a requirement for CIOs to have knowledge in the latest technology. CIOs don't need to know the latest computer language, they can just hire someone who knows. For almost every aspect of the IT platform, CIOs can bring in consultants, developers or temporary labour to achieve specific corporate goals. The greater challenge is understanding the existing and future needs of an organization and creating a functioning reality with the constantly moving technological landscape. In short, as the future approaches, CIOs need to lead with creativity and vision knowing resources are available to manage the technical aspects of a solution.

The following is a living example in the transportation industry. Many companies employ new growing technology sets such as telematics, mobile technology and business intelligence. In the Transportation industry telematics would provide information on driving habits, mobile technology would provide real time visibility on packages and business intelligence would provide reports on compliance for that particular employee. These technologies are used in many large companies today, in the same way, with the same success. These technologies have been deployed and are generating positive return on investment (ROI) that pays for the new technology deployment. This is a linear approach to technology, taking disparate solutions and having them operate to achieve a goal. The CIO as an artist would see technology as a blank canvas and work with technology as a medium to create something new. If these technologies were viewed as materials to create a new reality they could be combined to create something more innovative than what the technologies could offer on their own. This concept is known as integrative thinking and is not limited to artists, however, this is a trait that is common within a creative field.

By combining the telematics information with a business analytics platform and feeding directly into a real-time mobile program, transportation companies could give real-time analytics to their drivers thereby improving their performance proactively instead of reactively. To add, incentives could be provided to these employees to improve performance through scoring work functions based on quality and quantity of work and creating competition with other drivers in their terminals/region/country through a defined set of rules to further improve positive impact on an organization. This process is a form of “gamification” and is used as a way to affect consumer behaviors. Using these technologies in a creative and innovative way, as in this example, produces a better result for the organization. The artist, in an effort to connect emotionally with the stakeholders, needs to engage in multi-disciplinary collaboration. The CIO of the past, who focuses on technology first only sees a linear path to execution. The artist is engaging more aggressively with stakeholders to evoke an emotional response while providing a satisfying experience. With the changing dynamics in the application of technology for business use, and Canada’s falling level of competitiveness within the global environment, Information Technology (IT) leaders need to evolve. The questions this research project is trying to answer is:

How should existing CIO profiles evolve to compete in a new technological and global reality?

Why this Research is Important

Leaders in information technology typically have a strong background in programming, infrastructure or software engineering. These areas of focus for leaders help shape how they think, how they solve problems and how they connect an organization. With the commoditization of technology and rapidly changing technological environment CIOs need to change. In an environment where technical knowledge becomes obsolete as quickly as the technology it serves, long tenured CIOs need to take a

different approach to remain relevant. CIOs need make creativity a priority in their approach to technologies and how they integrate together in an effort to maximize the value of the corporate investment. This new understanding of a CIO's role has direct impact on the Canadian businesses and their ability to compete globally, and on a grander scale have a collective impact that can positively impact the Canadian economy.

Methodology

My literature reviews focused on four key research areas: the changing technological environment; innovation and the Canadian Landscape; review of the Chief Information Officer role, current and future traits; and finally research into the traits and qualities of a visual artist. This review was to set a foundation for my MRP and help drive the next phases of research.

I then conducted interviews of IT leadership across six industries: Finance, retail, construction, transportation, healthcare and manufacturing. These interviews were designed to understand existing technological challenges and future concerns.

Literature Review

The articles leveraged to drive this major research project (MRP) are divided into four categories: the changing world of technology, innovation and the Canadian landscape, the changing CIO and traits of an artist.

The Changing World of Technology

Technology is advancing at a rapid rate. Some argue mankind is heading for a singularity, where technological artificial intelligence exceeds human intelligence. We may not have reached the singularity yet but advancements are moving much faster with time. For over fifty years technologists have been driven by the predictions of Moore's Law, made by Gordon Moore. The prediction was that transistors on a microchip would double approximately every eighteen months. Fifty years ago

computers were large, cumbersome units which have now been reduced to a device that can fit in the palm of the user's hand. There is a theoretical limit to the size and speed of a computer but this demonstrates how rapid technological advancements are happening (Satall, 2016). Rapid change will be accelerated by quantum computing which is diminishing Moore's Law with new and more rapid advances in technology (Wolverton, 2016).

These advancements can cause new and stressful challenges for business leaders. Information technology has always been a risk-averse environment. The value of the internet of things, wearables or real-time vehicle diagnostics can be offset by security issues, privacy issues and regulatory challenges (Coleman, 2014).

Regardless of the challenges ahead Canadian business need to invest and more importantly, Canadian CIOs need to rise to the challenge to innovate on a level that pushes Canadian competitiveness higher in the global marketplace.

Innovation and the Canadian Landscape

In 2012 Canada dropped two places to fourteenth spot in global competitiveness as ranked by the World Economic Forum. Again in the 2016/2017 report Canada slipped another position to fifteenth place (Schwab, 2017). Canada has failed to capitalize on a strong infrastructure in increasing innovation and pushing the overall productivity of the country to levels that compete with nations such as Switzerland, Germany and the United States. Switzerland, who has maintained a strong position in the rankings for years, has created an advantage through innovation, advanced labour markets, and sophistication of its business sector (Clark, 2012).

Canada has been described as "weak in business innovation." As stated by the Conference Board of Canada, Canada is falling behind in global competitiveness due to poor business innovation performance by firms. Researchers have pointed to policies such as taxation, research and development credits, and

regulation for market issues. Other weakness lies in availability of “risk capital” as invested by business to promote innovation without focus on strict return on investment. Other factors include management willingness to take risks as their global counterparts do. Overall Canadian investment in technology and technological innovation is trailing their counterparts across the globe. There is no one specific root cause for our lagging productivity but lack of business sophistication and investment in innovative technology play a large role in our inability to compete globally (The Conference Board of Canada, 2013).

For Canada to increase economic growth and compete globally with other industrial nations, Canada needs to either increase quantity or quality of resources. Either of these functions increase a country's economy.

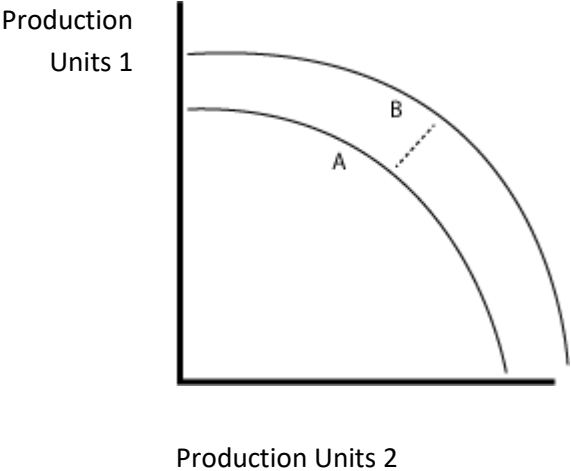


Figure 1. The Economic Growth Process

Economic growth is created through an outward shift of the production possibilities curve. With technological improvements affecting productivity the curve will shift outward from A to position B

In figure 1, economic growth is moving from A to B. This happens through an increase in resource quantities and/or resource qualities (AmosWeb Encyclonomic , 2017).

Increase in resource quantities can be through labour; achieved through population growth, immigration or participation in the workforce by those currently unemployed. Increase in capital can also achieve increases in resource quantities; this happens through investment either through domestic

or foreign funding. Finally, materials can play a role in increased resource quantities. This is achieved through mining or extraction of various non-renewable resources (AmosWeb Encyclonomic , 2017).

The two resource quality factors are: Education as it increases the quality of labour resources and Technology. Technology increases productivity and improves quality at the same time (AmosWeb Encyclonomic , 2017). Also included in resource quality or added value is the process of refining raw materials into a finished product instead of simply exporting the raw materials. With a relatively strong and accessible education system, and a strong focus on exporting raw materials, Canada needs to look to technological advancement to drive productivity gains.

Further showing the importance of resource quality and specifically the impact of technology, the productivity curve in figure 1.2 below illustrates how resource qualities such as technology have a stronger impact on economic growth than resource quantities such as increased capital. On the productivity curve depicted in figure 2, productivity (Y/L) is on the vertical axis and capital per hour of work (K/L) is on the horizontal axis. Increased capital results in a smaller increase in productivity through diminishing returns. The impacts of technology are more significant. In the example below the economy's starting equilibrium is at point A. Technological improvements shift up the productivity curve to a new equilibrium B. The new equilibrium C is a shift resulting from both influencers (Taylor, 2009).

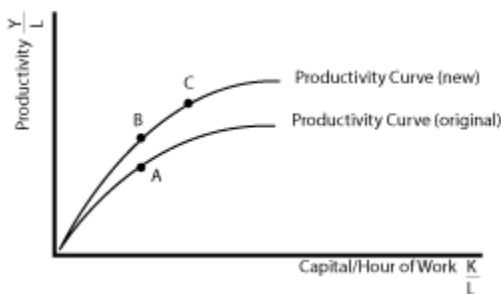


Figure 2. Productivity and Economic Growth

Resource quality (technology) increases productivity more dramatically than resource quantity (increased capital).

(Taylor, 2009)

Canada needs to increase global competitiveness. Canada already exports large quantities of raw materials limiting their ability to further expand economic growth through resource quantities. The biggest influencers to achieve this will be done through technological innovation or through the process of improving resource qualities. As part of increasing both productivity and sophistication in the business sector the Chief Information Officer needs to play a more active and creative role in Canada's technological innovation.

The Chief Information Officer

There are numerous articles on the CIO and what it takes to be successful in the current business environment. It is important to review these traits to get a sense of the gaps between the current requirements and future requirements.

CIOs have evolved in the last ten years. Where CIOs of the past needed exceptional technological knowledge, that requirement has changed with the changing business environment. There will always be a need for technical skills but the experts are prescribing flexible technical skills over specific technical skills. Business acumen and a need to understand the business reality beyond technology allows CIOs to be more integrated into the business. The ability to build relationships (across the platform) as well as obtain work experience in different departments is becoming more essential than traditional IT knowledge. No longer is the introverted technical expert needed for the role. The ability to communicate with the right person with the right level of communication skills are essential to be successful in the modern business environment. These attributes are new and different from the needs of businesses in past decades and they will continue to evolve (Waxer, 2012).

Other changes need to move a CIO from the concept of "CI-no" to "CI-yes." This concept implies that too often CIOs focus on the technical limitations of why something can't be done, instead of innovating a solution as required by an organization. The innovative and creative mindset is becoming more

prevalent as business leaders realize the limitations of the past no longer apply to the current technological reality (Tynan, 2017).

The modern CIO goes beyond just knowledge and relationship building. There are other traits that help build a capability that will help IT leaders manage future complexities. CIO.com lists Empathy as the first and most important trait of a successful CIO. This trait was not a factor in previous iterations of CIO competencies. Other traits include: dominance, self-awareness, flexibility, insightfulness, independence and knowing when to align with rules and when to question them. Again, the last point on rule-questioning is so different from the highly structured, rule-following IT leaders of the past (White, 2017).

The rate of change in technological advancement has forced the CIO to change as well. This change has been substantial. As technology continues to progress so too will the evolution of the CIO. This evolutionary requirement is further exacerbated for the Canadian CIO by the lagging productivity within Canadian industry. The Canadian CIO evolution needs a more creative, empathic and emotionally charged mind-set.

The Continued Evolution of a CIO

The premise of this research project is that information technology leaders need to move from computer scientist to visual artist. To understand this concept better we need to understand the strengths and weaknesses of both perspectives in an effort to show value within the context of technological advancement.

The Computer Scientist

Computer Scientists do have some obvious advantages in IT; they have a deep understanding of theoretical foundation of information and computation and the application of these two sources in technology. Computer scientists deal with software, software systems and the theory, design, development and application of both (University of Maryland, 2017).

As mentioned above, technology is changing at an alarming rate and so are computer languages. Coding preferences are changing rapidly to meet the changing technology landscape. Programmers dealing in software and software systems need to keep pace to maintain relevance (Nisan, 2015). This rapid evolution has given rise to the vertical of outsourced software development. Outsource software development provides risk mitigation, high quality, and fresh minds but also help with rapidly advancing technology. Being able to bring in expertise on a computer language without searching for a new hire has been of value for many IT departments (Orient, 2017). In short, the value of knowing software languages and software systems becomes obsolete as technology advances. To add, with the rise of outsourcing, finding the right talent for a specific project is becoming easier. Given the turbulent technological environment and commoditization of IT resources, IT leaders need to think differently to be successful in the emerging technical reality.

IT leaders need to move beyond the linear process of focusing on technology as an output (telematics, mobility and analytics as independent functions) and instead become more creative while tapping into the emotion of the stakeholder and work towards meaningful technological solutions that inspire their users to new levels of output.

The Visual Artist

There are several traits of a good visual artist that can help influence the new technological reality.

There are many attributes that depict what it is to be a great artist. Artists need an awareness of the audience so they know who they are creating for. Understanding the needs and the wants of the stakeholders needs to be at the forefront in developing a piece. Having knowledge of design principals and methods are paramount to a good work of art. Creativity does not stop at just the piece at hand but will continue on through the artist's future where they will infuse a high level of creativity in any project the artist focuses on. Creativity and strong design are important factors for any artist. Ingenuity and the quest for something new needs to distinguish the artist's work as much as an aesthetically

complimentary design. Design needs to marry all the aspects the artist is trying to convey in a representation that means something to the audience. Humility and an open mind to criticism. Artists cannot grow without knowing where to improve and where to focus for future opportunities. Knowledge of materials and the need to be familiar with different mediums, are important skill sets for artists to bolster a piece. Strong technical ability is another trait of the modern artist as they need an understanding of computers and how technology can enhance their work. Artists need a strong business sense on marketing their abilities and their work to create opportunities. Exceptional vision and the ability to picture a desired end result for a project or series is another important trait of a good artist. Finally a great artist needs passion. They need a strong and nearly uncontrollable urge to create something new, exciting and impactful (Art Schools, 2015).

A number of these traits are very applicable to the IT world. Still the list continues as there are other attributes of artists that can help enhance the technical world. Great artists are not afraid to make mistakes. They are motivated, ambitious and observant. Another extremely important ingredient is that they are original (Fussell, 2015).

These traits were not always characteristics of great artists. Much like technology art has significantly evolved over time, not in the same rapid pace as information technology, but art and artwork have gone through major iterations in history causing the artist to adapt to be successful in the new creative environment.

New Knowledge

The new knowledge created for this MRP is a new definition for a Chief Information Officer (CIO) required to be successful in the turbulent ever-changing technological landscape. The CIO of the future will need to be far more creative - relying less on the binary applications of the scientific world - moving towards a more integrative environment by combining disparate technologies to create a new reality.

With the commoditization of IT, resources are more available reducing the need for internal specialization. This creates a new environment for the CIOs where they need to move away from computer scientist to visual arts.

As mentioned above the CIO is already evolving. Improved communication, empathy and the need to find creative solutions are already enhancements that move beyond the traits of computer scientists. CIOs of the past were focused on a mix of technical projects that, at their core, were set in motion to automate backroom processes (May, 2016). The CIO today is much different.

The interviews conducted as part of this research project were designed to help understand the current state of CIO focus in Canadian business, and to better understand the require evolution of a CIO to drive competition globally. Through an in-depth discussion with current CIOs across six different market sectors, we gain a better understanding of how Canadian IT leaders are currently navigating the technological landscape as well as the ability to better predict their capabilities as the business environment grows more complex.

Chief Information Officer Interviews

As part of my subject matter, I interviewed several CIOs from different industries. The interviews were meant to provide insight into the thoughts of information technology leaders across different verticals within the Canadian industrial landscape. There were twenty-one interviews conducted across six different industries including; Transportation, Construction, Retail, Finance, Manufacturing and Healthcare.

Industry Selection Criteria

The industries were chosen based on relevance to the Canadian economy. Using the Statistics Canada website, six industries were selected from the top gross domestic product list as seen in figure 3.

Industries that relied on technology as a main source of revenue such as technology and cultural industries were not selected.

Statistics Canada Industry Listing by Gross Domestic Product

All industries	1,657,336	1,723,784	1,733,872	0.6	4.6
Goods-producing industries	474,157	507,899	516,087		8.8
Agriculture, forestry, fishing and hunting	28,374	28,320	28,342	0.1	-0.1
Mining, quarrying, and oil and gas extraction	120,136	144,400	151,064	4.6	25.7
Utilities	36,024	37,665	38,182	1.4	6.0
Construction	117,184	119,377	118,690	-0.6	1.3
Manufacturing	171,084	177,881	179,916	1.1	5.2
Service-producing industries	1,183,539	1,216,664	1,218,705	0.2	3.0
Wholesale trade	96,703	103,162	103,873	0.7	7.4
Retail trade	92,231	96,819	97,703	0.9	5.9
Transportation and warehousing	73,757	78,069	78,126	0.1	5.9
Information and cultural industries	50,842	51,211	51,280	0.1	0.9
Finance and insurance	119,299	125,304	126,444	0.9	6.0
Real estate and rental and leasing	219,233	224,604	224,150	-0.2	2.2
Professional, scientific and technical services	90,955	93,583	93,753	0.2	3.1
Management of companies and enterprises	12,168	12,064	12,071	0.1	-0.8
Administrative and support, waste management and remediation services	42,214	42,386	42,521	0.3	0.7
Educational services	88,177	88,856	88,929	0.1	0.9
Health care and social assistance	112,454	113,719	113,772	0.0	1.2
Arts, entertainment and recreation	12,285	12,889	12,438	-3.5	1.2
Accommodation and food services	35,284	36,229	36,117	-0.3	2.4
Other services (except public administration)	32,244	32,389	32,342	-0.1	0.3
Public administration	107,819	108,587	108,581	0.0	0.7

Figure 3. Stats Canada GDP 2016

Retrieved from the Statistics Canada Website, Gross Domestic Product at Basic Prices by Industry (monthly) on 08/17/2017 <http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/gdps04a-eng.htm>

The final selection criteria was based on the ability to secure CIOs from the remaining industries. The distribution of interviewees by sector is depicted in figure 4 and is as follows:

- Transportation – five interviewees
- Construction – three interviewees
- Retail – four interviewees
- Finance – four interviewees
- Manufacturing – three interviewees
- Healthcare – two interviewees

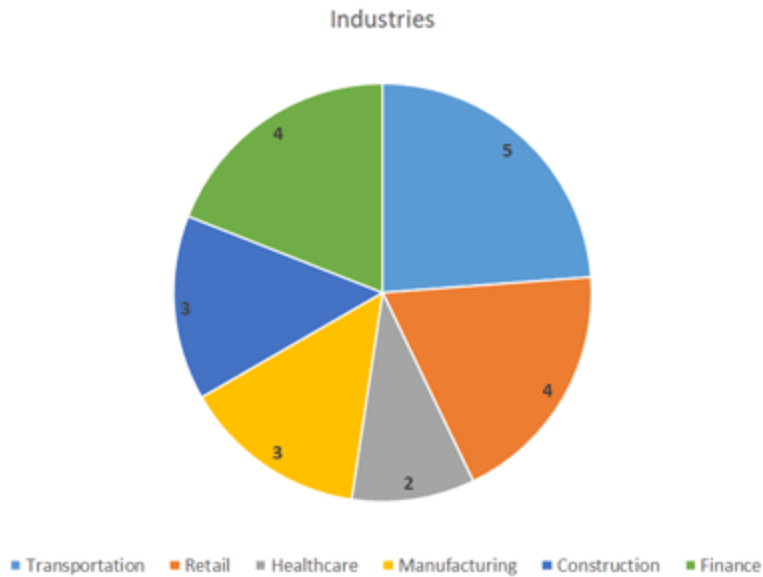


Figure 4. Breakdown of Industries Researched in Interviews

The Interview Process

Each interviewee was sent an email highlighting the parameters of the interview and requesting their participation. The interviews were conducted via phone call and progressed anywhere for fifteen to thirty minutes. The names of the individuals or their companies were not recorded for the interview, only date and industry. Notes were made for each interview. For specific questions answers were categorized in effort to build an understanding of general trends around technologies. Interviewees, in some cases, were asked which categories best suited their answers when categorization was not clear. Due to time constraints in the interview process, some interviewees were not pressed on answers.

Interview Questions

The interview questions were designed to understand technological priorities for each CIO. The purpose was to gauge the level of investment in innovation in an effort to assess probable impact on productivity by organization and also by industry. A copy of the interview questions can be found in Appendix A.

The questions were designed to drive these insights from the various IT leaders in effort to understand the state of technology in the six industries investigated. The questions were developed to understand the following components of an IT leader's perspective on technology:

1. Past Influencers of Technology Decisions
 - a. Question 1
 - b. Question 2
2. Current Influencers of Technology Decisions
 - a. Question 3
 - b. Question 4
 - c. Question 5
 - d. Question 8
3. Preparation for the Future
 - a. Question 6
 - b. Question 7
 - c. Question 9
 - d. Question 10
4. Motivation for foresight
 - a. Question 11
 - b. Question 12

The process was designed to understand if IT leadership is evolving to the new technological realities that will influence their organizations.

Interviews were conducted over the phone and recorded through note taking for data analysis. Working with the interviewees, answers were summarized for analytical purposes and were entered into survey monkey, a data collection software for analysis.

Research Findings

IT was not taking an active role in participating in innovation. The IT teams did not seem to lead innovation teams nor did they seem to be actively participating in innovation sessions with the rest of the organization. This is not to say there was no innovation coming from IT, there were interviews that did highlight some role in new technologies, but rather overall the participation in innovation from IT in the various industries was much less than anticipated. This was evident during the conversations where, when questioned about specifics, IT leaders were not embracing innovation like other areas within their organization. For example, innovation teams were typically led by other areas of the organization as seen in the Construction industry where Operations took leadership on finding new technology for improving productivity. The IT leaders were very aware of other parts of their company focusing on

innovation but acknowledged, in some cases, they were not embracing innovation the same way as their fellow executives.

With over twenty interviews completed I have broken down general trends within each question with some salient points that were highlighted by individual leaders.

Question 1: Top IT investments over the past three years?

Respondents were asked to rank the following investment areas in order of investment. Areas included:

- Infrastructure
- 3rd Party Software
- Mobility
- Automation
- Security

The investment priority ranking are illustrated in the graph in figure 5:

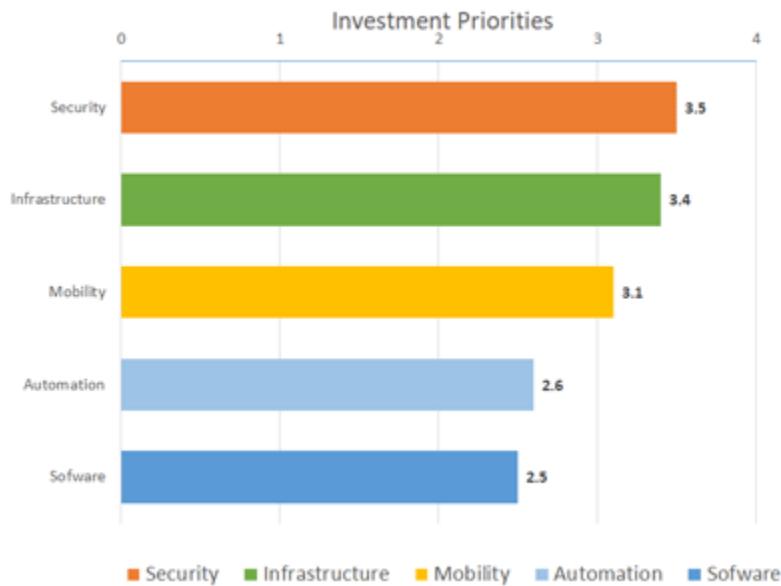


Figure 5. Investment Priorities for Interviewees

High Level Results Analysis

Security and infrastructure were the top investments for the IT leaders interviewed followed closely by mobile investments. Automation and 3rd Party Software were lower on the list for most industries with

a few exceptions. This question illustrates the priorities and what is important with regard to investment within IT departments and are important to the evolution of an organization.

Discussion Points from Interviews

Security Investment

There was a lot of concern around security in the Finance, Retail and Healthcare segments. Security came up many times during the conversations as a growing risk and key focal point for IT investments. Given the sensitivity around financial information, customer retention and medical records it makes sense that Finance, Retail and Healthcare are investing most of their budget in these areas. IT leaders not only put the bulk of their IT spending in these areas over the past three years, they also planned on continuing to invest in security in the foreseeable future.

Infrastructure Investment

IT leaders generally spoke about infrastructure in the same context as security. Speed and reliability in Finance, Retail and Healthcare were also linked to their ability to keep data safe. Construction, Manufacturing, and Transportation had less focus on security and infrastructure, although in these industries speed and reliability are still important. The big difference in the sectors were the level of importance placed on these technologies. During the interviews the leaders from the Construction, Manufacturing and Transportation sectors were aware of several old components within their environment and placed a lower priority on upgrading them, whereas Finance, Retail and Healthcare were less accepting of antiquated technology.

Mobility Investment

Mobilizing the workforce fell slightly behind security and infrastructure. Most Transportation executives put mobile investment near the top of their list, as well did Healthcare. Construction had a growing

interest in mobile technologies for field staff in an effort to automate a number of the paper processes currently employed in the field.

3rd Party Software

In discussions with IT leadership 3rd Party software was lower in the investment list. In industries like Healthcare there was a conflict with mobility as it was largely driven by 3rd party applications. This skewed the perception on priority as the hardware, in total, seemed to cost more than the software thereby putting mobile platforms ahead in ranking. The same was true for Construction and Retail platforms who, generally speaking, were driven by 3rd party software platforms.

Automation of Manual Processes

Much like the 3rd party software discussions, IT leaders saw the automation of manual processes as a byproduct of mobile investment and investment in 3rd party software. Mobile investments were made to improve productivity by automating manual processes.

For Finance, Retail, and Healthcare there was a similar effect as automating manual process had a direct impact on security, and subsequently their investment in a more robust infrastructure.

Interesting Conversation Notes:

Mobility

Transportation has a continuous investment in mobility with the caveat that these investments happen every five to seven years. Several of the IT leaders in Transportation acknowledged that mobile technologies commandeer a large portion of their budget but on longer depreciation cycles. For one of the IT leaders they are currently investing in new mobile devices along with a significant software re-write as an upgrade to their legacy mobile devices. As part of the conversation the IT leader discussed the lack of new innovation in the software rewrite citing the hardware upgrade was the bulk of the new

innovation in the upgrade. The company is expecting productivity gains but mostly through improved hardware uptime versus new or innovative processes.

Health care leaders highlighted mobility as a growing investment within their environment as well. In health care there is a growing movement to mobilize the workforce allowing healthcare professionals to collect data using mobile devices. All of the leaders interviewed for healthcare were using 3rd party software for data collection and had little input on the design and evolution of the software they selected. The request for proposal for the software was generally written by the Operations staff in conjunction with IT.

Summary of Findings

Security and infrastructure were the top investments for the executives interviewed followed closely by mobile technologies. Automation of manual processes and third party software were ranked lower for investment but in general terms seemed to be offset by investment in technologies such as mobility as the sectors typically automated processes using their mobile platform and third party software.

Key Takeaways

There was little conversation about these investments driving new or innovative changes within the various organizations. In Finance, Retail and Healthcare, investment in security and infrastructure was seen as very innovative by the leaders interviewed. When pushed on productivity gains from these investments there seemed to be very little with the exception of environment stability and reduction in issues due to security breaches. In areas like Transportation, where mobile investments were top investment areas, IT leaders were changing some processes and/or offering new products as part of the change but there was no real focus on productivity enhancements. Leaders saw the replacement of old hardware as the innovation that was changing their organization.

Question 2: Driving Factor for IT Investments?

The executives were probed further on why they ordered their investment focus in the way that they did. The idea was to understand the overall strategy for investment over the past three years.

High Level Results Analysis

After discussion with the IT leaders I asked which area most likely represented their investment motivation. Executives were given one of four categories to choose from:

- Security Concerns
- Legacy System Upgrades
- Cost Reduction
- Innovation

The results of the discussion pointed to a clear desire to upgrade legacy technology systems. From mobility to security, the bulk of investment was modernizing technology as illustrated in figure 6.

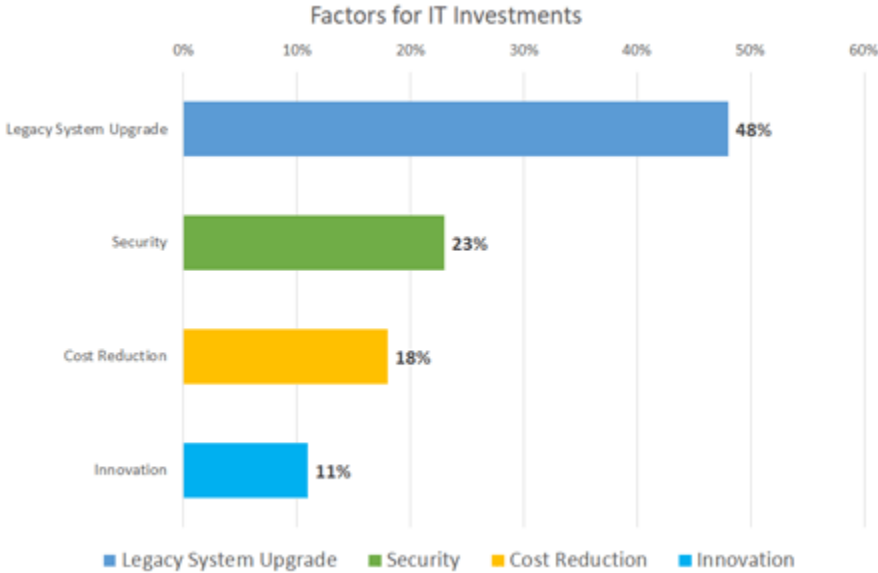


Figure 6. Factors for IT Investments

Discussion Points from Interviews

Generally the executives interviewed all seemed to have a strong need to upgrade legacy systems. Old infrastructure was one area of motivation as well as legacy software. Many organizations within the study had backend end systems that were in production in the late 90’s and early 2000’s. Each system

had long been depreciated but leaders were cautious to move away from old technology for fear of significant business disruption. Where hardware upgrades were simply a matter of budget, system changes were directly affected by change management issues, customer expectations and internal buy-in. These impediments put pressure on many IT departments commandeering the bulk of their resources both from a budget perspective and from a labour perspective. Legacy upgrades were of importance to almost every company.

Security was a concern, as stated previously, for Finance, Retail and Healthcare. There was continual focus on security for these industry leaders commandeering a good portion of their IT spending.

Cost reduction and Innovation were less of a motivator for the executives interviewed. As noted by one of the executives, cost reduction and innovation typically go “hand in hand” as their company is continually looking for innovative ways to improve process and save cost. That said, there was no directed focus for IT leaders as their priorities were elsewhere within their scope of influence.

Interesting Conversation Notes

Legacy system did dominate the bulk of the conversation around question two. As stated by almost twenty percent of the executives, the IT department’s ability to innovate is stifled by the focus on legacy upgrades. The remaining eighty percent of the executives did not mention innovation as an impending investment initiative. The point is an interesting dichotomy of old technology preventing investment in innovative solutions that could propel new technology. So much focus was put on the change management process and the impacts on both internal and external customers, IT leaders lost focus on innovating beyond the need to replace an old system.

Question 3: Size of the IT Budget?

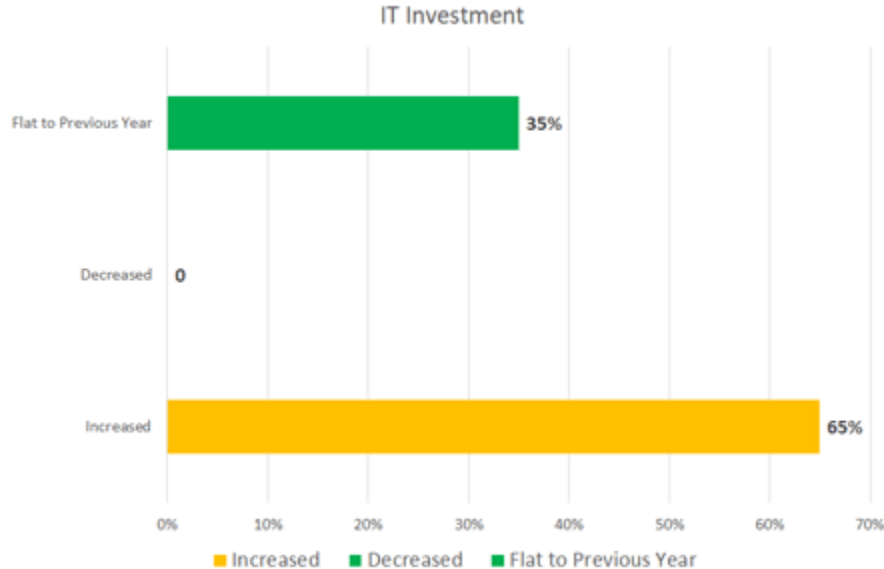
Executives were asked if over the past three years they have seen an increase or decrease in their IT budget. They were also probed on the cause of the increase/decrease.

High Level Results Analysis

Most IT leaders saw an increase in their IT budgets over the past three years and expected increases to continue in the future. Much of the conversation centered around an increasing reliance on technology and the proliferation of new technology into other areas of the business.

IT leaders also saw the modernization of their technology sets as an important factor in investment. As stated in the previous question, legacy system refresh was a big budget item. Note that no IT leader had a reduction in budget. Although cost cutting was something felt in their operations, no IT leader mentioned reducing spend on technology.

About thirty percent of the interviewees stated their budgets remained the same as the previous year. The leaders, whose budgets were flat to previous year, were mainly in Transportation with other respondents being in Finance and Healthcare. In cases where budget was flat, the cause was an expectation from the business to be in maintenance mode versus growth or expanding on existing projects. These leaders did not talk about innovation or have any organized program to develop new technologies. The breakdown of IT department’s budget increases/decreases is depicted in figure 7.



Interesting Conversation Notes

In Transportation increased IT spending was project based. If there was an executive decision to replace a legacy system or upgrade equipment the IT leader would see a temporary one time bump in budget. Otherwise the budgeting process was a “top down” process where they were given funding and expected to plan their fiscal year finances into what was allotted. If the transportation leaders wanted to invest in new technologies they had to make cuts from other areas of their budget. The CIOs interviewed used this top down process as one of their points for not investing in innovation as it simply wasn't in the budget. To complicate their environment, IT leaders were not given funding to experiment with new technologies. Without a testing framework, experimentation and continually learning, the budgeting processes presented a real challenge for CIOs to implement new and innovative solutions without significant risk. Further discussion highlighted that this approach made the desire to invest in new ideas or technologies less appealing as the IT leader did not want to squander funds but rather invest in known solutions.

Healthcare was very similar to transportation, the IT departments that saw flat budgets were hesitant to invest in new technology. One of the IT Leaders pointed out that this is one of the most significant reasons their IT department outsources technical work. These leaders felt the probability of success was higher using outsourced labour.

Question 4: Importance of Return on Investment (ROI)?

Interviewees were asked the importance of ROI on their IT decisions. As a follow up they were asked if any technology had specific ROI requirements. They were also asked if they regularly meet ROI expectations and where the ROI comes from (efficiency or revenue improvement).

High Level Results Analysis

Generally ROI played a pretty big role in IT investments for the leaders interviewed in this study. Over fifty percent said ROI was very important for investment decisions and almost six percent said it was the most important decision for IT investments. Higher focus on ROI generally came from the Transportation industry along with Construction and Manufacturing. Forty percent of those interviewed said that ROI has some to little bearing on IT decisions. This was generally found in the Finance and Healthcare industries. Retail sat somewhere in the middle where some respondents said ROI was important while other leaders said it was less important. The breakdown of respondents' answers on return on investment is illustrated in figure 8.

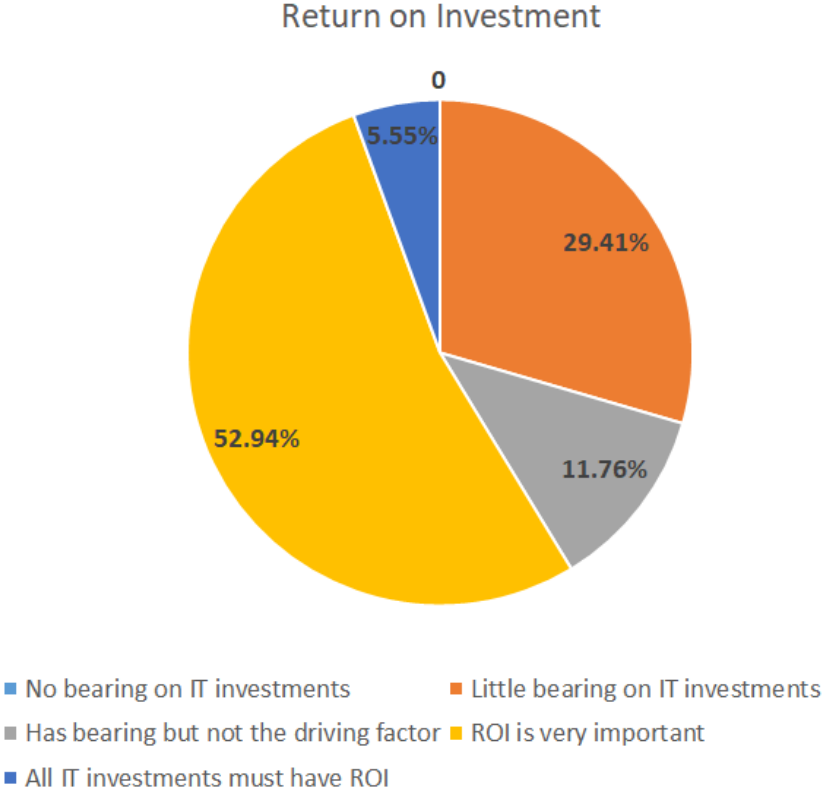


Figure 8. IT and ROI

Discussion Points from Interviews

Typically in industries where compliance was a significant factor, such as Finance and Healthcare, IT leaders were given funding to meet these compliance standards. Based on conversation this is true to a

lesser extent in Retail. In industries like Transportation, Manufacturing and Construction, new technology had a larger responsibility to provide a return. IT leaders in these areas stated there was little revenue to be gained from IT investments and instead the ROI for these investments were generated through cost savings. In Transportation a couple interviewees stated that, especially for legacy equipment, they included cost avoidance in their ROI calculations (the benefit of not losing money through outages, increased repairs or service interruptions).

Interesting Conversation Notes

In industries where ROI was not a factor it seemed IT leaders were focused on the security aspects of IT. A few leaders in Finance and Healthcare were adamant that they were protecting data at all cost. They made decisions that accounted for large parts of their budget without any business case or return on investment.

In industries where ROI was a factor in decision-making there was greater pressure on the leader to ensure investments were successful. Generally for security investments leaders were regularly investing regardless if there were historical security breaches. With a proactive approach to technological security their success was based on the prevention of issues. In industries like Construction IT leaders had to show returns in relatively short time frames on their investments. The success of these investments would potentially drive more investment in future years (if successful). Conversely, the IT Leaders worried that lack of success would reduce budget and affect their ability to evolve. This attitude reduced the desire for risk within these environments and pushed leaders to seek out solutions that had proven success within their industry.

One IT leader in construction invested in GPS technology to track trucks and employee time. The investment yielded a contentious conversation with operations, as employees did not want to be tracked or monitored. The company was extremely happy with the investment and found the returns to

be significant. The IT leader is now looking into other technological investments for the organization to reduce paperwork and efficiency despite pushback from the employee base.

Question 5: If your budget increased by 10%, where would you spend it?

The interviewees were asked if they were suddenly given an increase in budget of 10%, where they would spend the extra funding.

High Level Results Analysis

Fifty percent of those interviewed stated the extra budget would go into replacing legacy systems. Clearly replacing old equipment is top of mind for these professionals. To add, this shows that the existing IT budgets are not enough to move many of these companies to new platforms and that the old platforms were large and difficult to change.

Increasing staff and purchasing new equipment were the next two investment opportunities. Many of the IT leaders felt they could also use more labour to complete projects.

Only a few respondents wanted to invest in research and development (R&D). What is interesting about this is, the few who wanted to invest in R&D were from the transportation industry. This insight coupled with the responses on ROI shows a desire for some IT leaders to push innovation through funding that does not require ROI, creating an assumption that innovation is stifled through expectation on returns on investment. Note that Operational IT investments such as Telematics or Mobile devices should have an ROI and exploratory investments such as prototype units and test units should not require ROI but rather bring to an organization new knowledge that mitigates the risk of deploying new technology solutions.

The breakdown of increased budget results is depicted in figure 9 below.

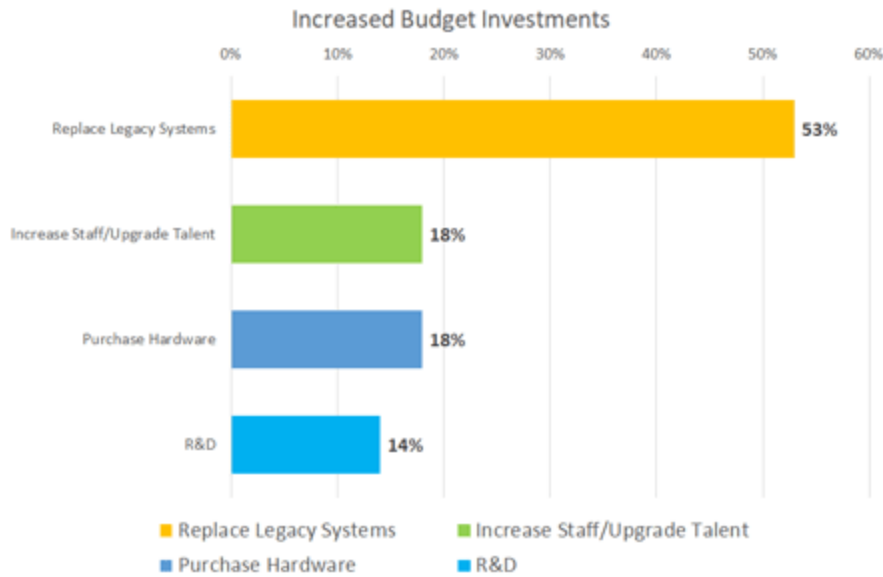


Figure 9. Increased Budget Allocation

Discussion Points from Interviews

During the interviews I was able to group responses into four categories; increase staff/upgrade talent, purchase new equipment, replace legacy systems and research and development. Over fifty percent of the IT leaders interviewed would use extra budget to replace legacy systems. Even in Finance and Healthcare where ROI was irrelevant, there still seemed to be a focus on replacement of old technology. Increasing staff and buying more equipment accounted for over thirty percent of the respondents investment focus. Staffing typically came from companies that had smaller IT departments, which seemed to be most evident in Construction and Manufacturing. Just over ten percent of the leaders interviewed would invest in R&D, and most of those interested were in transportation. In discussion this seems to be driven by the anxiety on ROI from the previous question.

Interesting Conversation Notes

The burden of legacy systems has been very evident throughout many of the interviews. Old technology really seems to have a negative effect on many IT leaders ability to properly manage the future. Many of the interviewees put a damper on innovation. A number of IT leaders stated they were more worried

about meeting status quo than they were about doing something new. This question really highlighted that issue for many of the CIOs.

The notion of research and development was never on the minds of the IT leaders with a couple exceptions. The leaders, who did highlight R&D, mentioned it as a desire to simply try something new. One leader in particular mentioned that there is a lot of new and interesting technology on the market they would like to test.

Question 6: Does your IT have a strategic plan?

The interviewees were asked if they have a strategic plan for IT and if so, how it was developed and did they engage the organization.

High Level Results Analysis

Most executives had a strategic plan. Also executives looked beyond the next year and were forecasting out for the next three years. Fifty percent of executives had a plan that was looking out three years. Thirty percent had a plan that looked out for the next year and almost twenty percent did not have a plan at all.

A high percentage of executives who had a plan said the plan was documented and available to share with the organization. All executives in Finance had a properly documented plan and had a vision that spanned out three years. In industries like Transportation, Construction and Manufacturing, plans were either nonexistent or only spanned the course of one year. One transportation company had a vision that extended out three years. Below is the breakdown of IT departments with strategic plans as illustrated in figure 10.

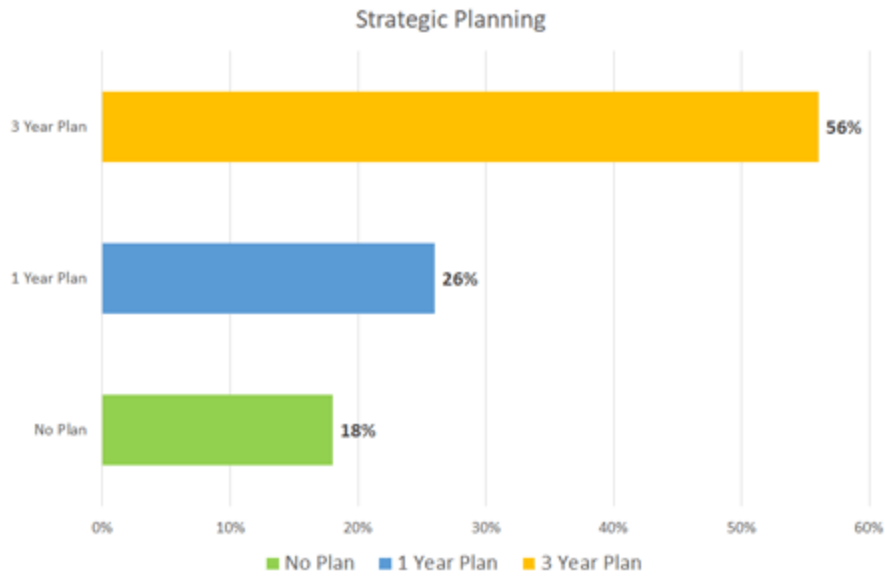


Figure 10. Strategic Plans

Discussion Points from Interviews

In discussion with the IT leaders most mentioned that their plan was developed with their team and shared with fellow executives. In companies where IT leaders reported to the chief financial officer (CFO), their plan was developed in conjunction with finance. The breakdown of CIO reporting structure is shown in figure 11.

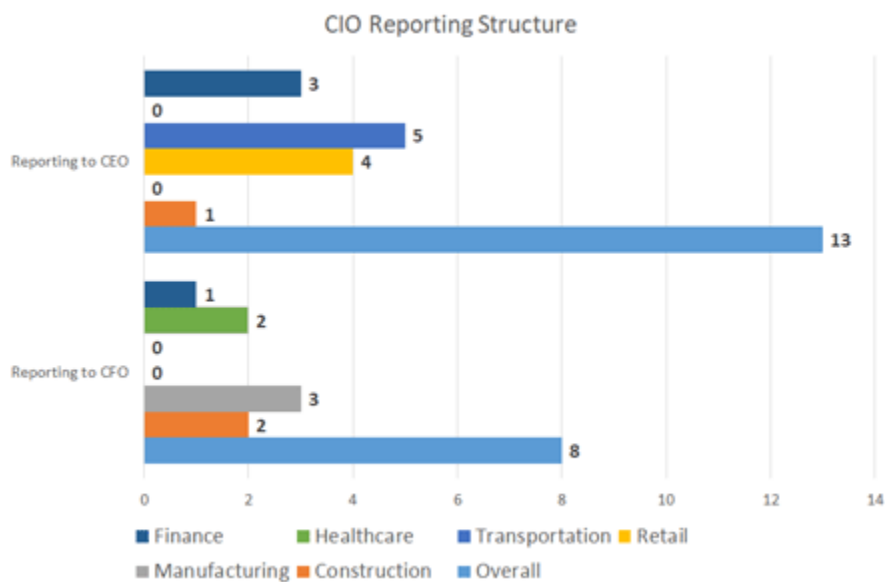


Figure 11. CIO Reporting Structure

In Transportation and Retail IT took a lot of direction from Operations. Operations plays a big role in dictating priorities for these industries and their priorities. Note that none of the CIOs in these industries reported directly to Operations but worked in partnership under the direction of the Chief Executive Officer (CEO).

Retail leaders also mentioned they worked closely with customers through electronic data interchange (EDI) and similarly with various vendors. With the connectivity between various groups within their supply chain, the IT leaders in these industries had communication with customers and vendors when developing their strategic plan.

Interesting Conversation Notes

Almost fifty percent of the executives interviewed made note that although they had a strategic plan, the plan lacked a high level of detail and, in some cases, executives admitted there was not a lot of supporting documentation. Several executives noted they had an approved plan and high level details. When pressed if they were to leave would the plan be executed on successfully, approximately twenty percent of the executives answered no.

Other comments by the executives included the idea that building a five-year plan was not valuable. Technology is changing so rapidly that executives had issues forecasting concrete initiatives beyond a three-year perspective. The CIOs interviewed were ultimately looking at investments in technical terms and not evaluating it from a strategic business perspective. Some examples of this were evident in industries like Transportation. Transportation had a strong plan to replace legacy devices because of age and wear but excluded from that plan were the strategic business objectives associated with the mobile change as part of the justification (productivity improvements or software enhancements). Similarly in Retail, the IT Leaders had a good sense of the infrastructure changes they

needed to make due to obsolescence but no insight into technological changes that would affect productivity over the next three years. This was also evident in how these IT leaders were socializing their strategic plans with the organization.

Several of the executives mentioned the movement off of legacy systems was the main focus of their strategic plans. They also commented that legacy system upgrade was the biggest contributor to delays in their plans. The breadth and scope of legacy upgrades complicated their ability to execute on several other future initiatives.

In industries such as Finance and Retail, consultants played a big role in their future plans. Several interviewees mentioned engaging consultants in the development of their strategic plans and the steps taken to ensure the technological future of their organization.

Some other comments of interest in most industries included that the IT strategic plans were not shared beyond the executive team with the exception of operational leaders (in the case of Transportation and Construction) and in some cases customers and vendors (in the case of Retail and Healthcare).

Overall it was observed that there was not a lot of engagement of employees in the development and deployment of the information technology strategic plans.

Question 7: How far out are your IT decisions?

The interviewees were asked, in years, how far out are their IT decisions. They were also asked how they determine how far out they look and how often do they reassess their understanding of the future.

High Level Results Analysis

As stated in question six, approximately eighteen percent of executives are looking to the current year, approximately thirty three percent are looking out one year and over fifty two percent are looking out past three years. Interviewees also mentioned that with the rapid advancement in technology, looking out five years was almost impossible and not of value. Almost all of the IT executives mentioned they

review their plans as part of budget review and make adjustments where necessary based on input from their organization.

Discussion Points from Interviews

The Financial, Retail and Healthcare industries seemed to have a good sense of investment for their mobile programs. IT leaders knew their plans for the next three years with a good vision on how to get there. Transportation also had a very financially mature view of mobile technologies understanding depreciation cycles and requirements for future investments.

Legacy systems were brought up several times during the interviews around this question. Replacing these systems were a large financial and resource burden.

Interesting Conversation Notes

Several of the industries commented that their ability to forecast out is limited by the changing needs of Operations and other departments within their organization. One executive commented that Information technology's ability to support the organization is limited by the fickle nature of their internal customers. Several of the leaders interviewed attend tradeshow and conference in order to understand the changing nature of their environment and bring solutions to their teammates. As depicted in figure 12, approximately eighty percent of the IT leaders surveyed attend tradeshow and conferences regularly with approximately twenty percent not attending (these leaders were in Construction and Manufacturing).

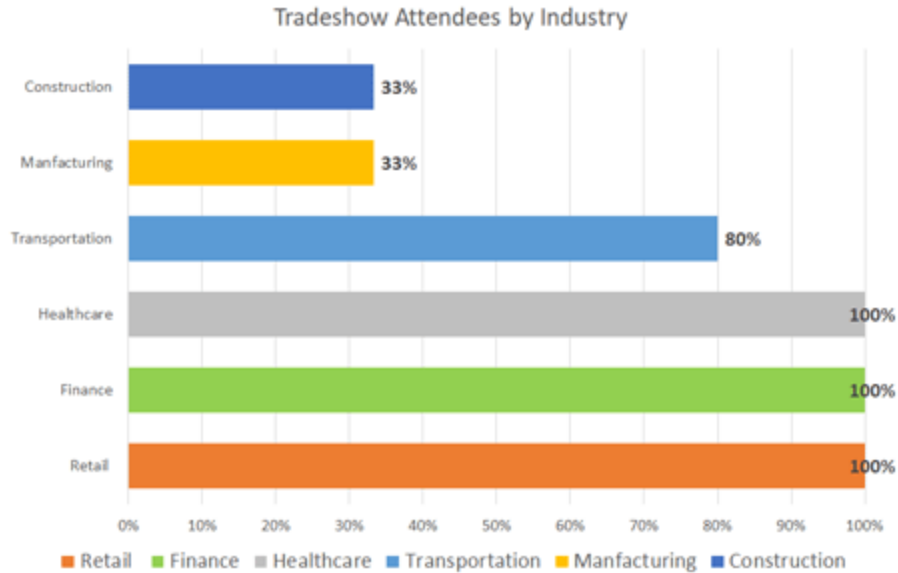


Figure 12. Tradeshow Attendance by Industry

Question 8: Describe the role of the IT department in your company?

Interviewees were asked what role the IT department plays in the company. They were asked to do this in one concise sentence.

High Level Results Analysis

The IT executives interviewed were asked to give a concise answer describing their role in their organization. The answers can be categorized into three areas:

We keep the lights on	This describes an executive response where they inferred their team ensures the technology systems are always running.
We supply solutions to our customers	This describes an executive response that is more customer centric. This is an environment where an executive works to provide a better experience to their internal and external customers.
We execute on the needs of the organization	This describes an executive response that is following the lead of a secondary department within their organization such as operations, engineering or finance.

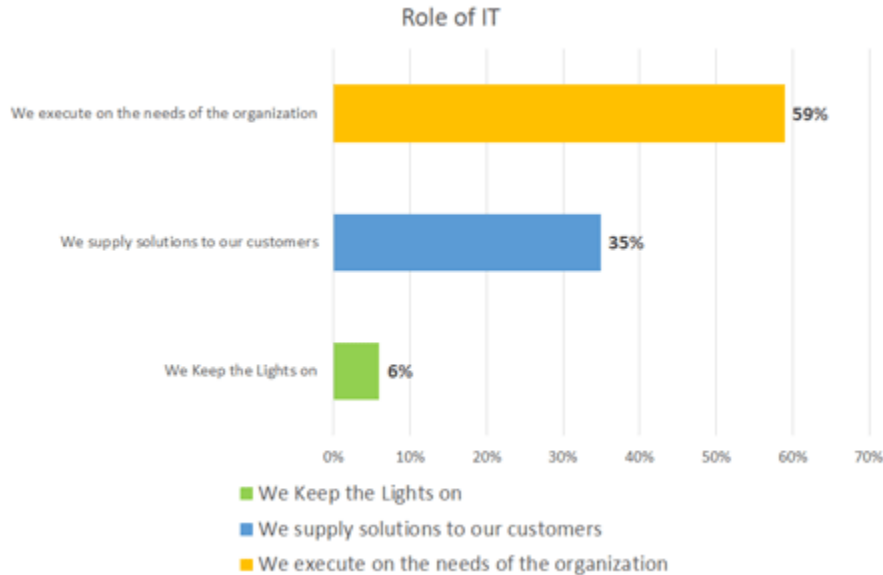


Figure 13. Role of the IT Department

As depicted in figure 13, the majority of the executives took direction from other departments with almost sixty percent of the respondents executing on the needs of the organization. This was evident in most of the Finance, Healthcare and Transportation industries. All CIOs, who reported into a CFO, fell into this category. The organizations that supplied solutions to customers were in Retail and Construction, with some respondents from Transportation. The one industry that was maintaining the status quo was manufacturing.

Discussion Points from Interviews

Manufacturing IT decisions were influenced largely by engineering. Engineering provided many of their specifications for integration, uptime and data flow. In Construction, IT worked largely with Operations to source and implement solutions. Many of the solutions worked on were mobile opportunities brought to IT by the operations team. Transportation was a combination of Manufacturing and Construction working with both Engineering and Operations on their larger projects. Retail IT seemed to

have more of a say in the solutions provided to their organizations. IT had strong familiarity with the 3rd party products utilized by their internal customers and played a big role in bringing solutions forward. The Financial companies were given standards to deliver upon, as dictated by the executive team, putting them as a hybrid solution provider executing on the needs of the organization.

Interesting Conversation Notes

Two interesting notes came from the roles and responsibilities discussion. The Manufacturing IT leaders had little to no input on innovation; they were solely executing on requirements provided from Engineering. With the exception of two IT leaders in Retail and select departments within Transportation IT, there was little interaction with the customer base for solutions.

Question 9: What role does innovation play in your company?

Interviewees were asked: what role innovation plays in their company, how does innovation get exposed with the various parts of their organization, how are ideas rewarded and what role do vendors/partners play in innovation?

High Level Results Analysis

Responses from each executive were put into five categories:

1. Not enough innovation happens at my company
2. Innovation happens when we are asked
3. We try to innovate about once a month
4. We innovate more regularly than once a month
5. We are constantly innovating

Based on the interview questions leading up to question nine it was no surprise that not a single interviewee had identified a strong tendency towards innovation. About thirty percent of the executives said that innovation was not happening enough. Over thirty five percent of interviewees said that they innovate when the business has a difficult request. Over twenty percent identified they have regular innovation meetings (every four weeks) to discuss ideas not solicited by their customers (internal

and external), and just over ten percent said they facilitate innovative discussions on a weekly basis. These statistics are represented in the chart in figure 14.

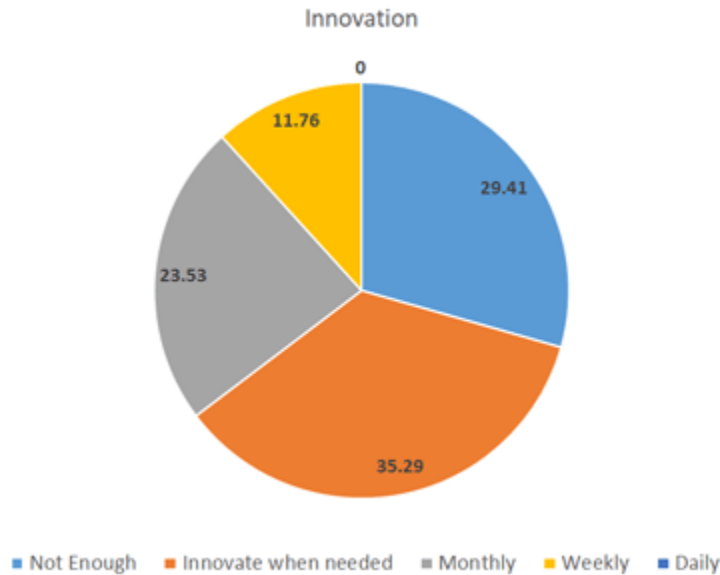


Figure 14. Focus on Innovation

Discussion Points from Interviews

Not a single IT executive across the various industries had a formal innovation process within IT.

Although there were innovation processes that seemed to exist within their company, IT did not actively participate or conduct innovative processes of their own. Despite the lack of process, approximately eighty percent of the IT Leaders said they had an innovative culture within IT. Their perspectives were based on the information technologies team’s ability to solve problems on behalf of the organization.

Interesting Conversation Notes

Interviewees were asked if their companies had any distinguishing innovations that separated them from their competition. Many of the answers were fairly general and could not point to IT initiatives that were differentiators to their competition. The closest was through mobile investing, where one organization purchased a device that was not widely used in the market.

Question 10: How much budget is allocated to innovation?

Interviewees were asked how much of their budget was allocated to innovation or testing new technologies. They were also asked if they had an internal process for innovation and what part of the organization is involved.

High Level Results Analysis

Answers were categorized into five groups:

1. We don't invest in innovation
2. We sometimes test innovation but rarely
3. We tactically test innovation
4. We have used bleeding edge technology regularly
5. We frequently work with new ideas and concepts

Just over eleven percent of interviewees said their IT departments don't get involved in new innovative solutions. The manufacturing companies were in this first category. Typically these companies did not want to spend their limited budget on information technology that was not proven and were mostly concerned with keeping the IT systems functional. Just over thirty three percent of interviewees said they have on occasion invested in new and innovative technologies. The seventy five percent of the Retail companies fell into this category. Almost forty five percent of the companies fell into the third category of testing innovation where it made sense. Sixty percent of the transportation companies identified with this group with Construction and some financial companies also falling into this category. Just over eleven percent of respondents were frequently investing in leading edge technology. As depicted in figure 15, the companies that were more likely to invest in new technology were in the Finance industry, and focused on new security technology.

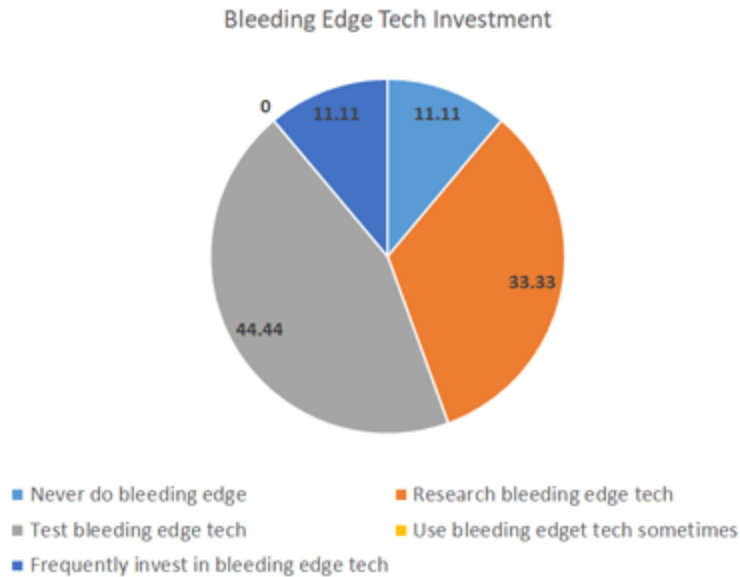


Figure 15. Investment in New Technologies

Discussion Points from Interviews

Trade shows and conferences were a big source of innovation for the various IT leaders with the exception of two companies. Most leaders found new ideas and solutions for their organization through vendors at these events. Also mentioned was the ability for companies especially in the Transportation, Manufacturing, Construction and Retail to work with competition to get insight on new solutions and processes. There are a few examples that were presented in the discussions. The most prevalent was in Transportation. There are many partnerships that occur in transportation between competitive companies that have created a cooperative spirit with technology. For example, if company A does not have a delivery network they will partner with company B. If company B does have technology that will provide the same level of visibility on packages, company A will provide suitable technology that can augment company B’s existing portfolio or set compliance standards that will overall improve company B’s performance. Another example was discussed in Retail. The Retail companies interviewed use 3rd party software to manage some of their retail needs. Several retail companies use the same 3rd party vendor. These 3rd party vendors create user groups, who help guide software development on behalf of the industry. If company X has an innovative idea for the 3rd party software they will fund the

development on this enhancement, which will be available for company Y in the next software release. These user groups help guide the technological evolution of the software knowing they are allowing their competition who are also users of the 3rd party software to advantage of the new innovation.

Interesting Conversation Notes

The Healthcare industry had good insight on what their competition was doing. One executive mentioned there were a number of industry events where Healthcare companies shared information with their counterparts. Transportation seemed to be the next big industry for sharing information. The IT leader at a large organization stated that several of their executives had worked with the competition during their career and discussions happened regularly regarding technology and new applications.

Question 11: What is your differentiator relative to your competition?

Interviewees were asked what their differentiator was compared to their competition and what role technology plays in that differentiation. Leaders were also asked how they plan to maintain that differentiation over the next three years.

High Level Results Analysis

Answers were put into five categories:

1. Technology has no influence on our ability to compete
2. Our Technology has some influence on our customers but it's not a game changer
3. Technology plays a role in how we sell – we need to be competitive
4. Technology is an important factor in our ability to compete
5. Our success is very dependent on our technology

The first two categories were dominated by Construction and Manufacturing. The executives from these industries felt technology played a very small role in their success within the marketplace. The next two categories collectively held over seventy percent of the respondents. These categories had technology playing a larger role in the company's ability to compete. Most companies do see the value of strong technical offerings as having an impact on their revenue stream. Only one IT leader saw

technology as their competitive advantage. This company was in the Financial sector. Results are illustrated in figure 16.

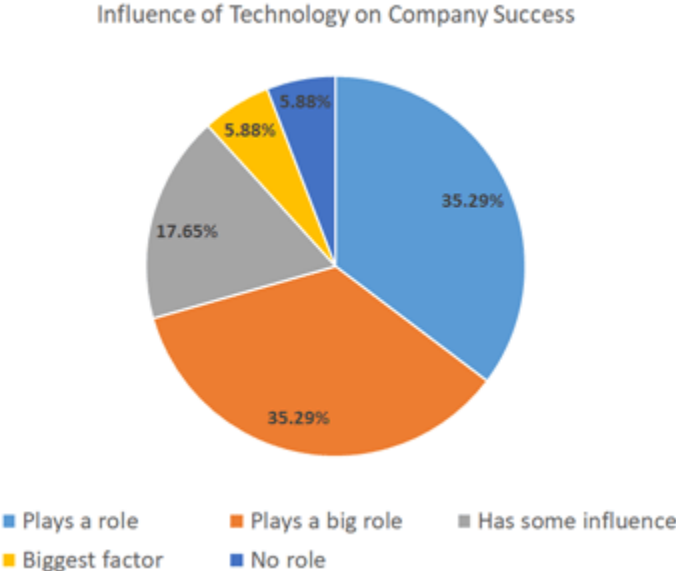


Figure 16. Influence of Technology on Future Success

Discussion Points from Interviews

The Financial interviews continued to promote security and speed as the key to their future. The Transportation executives saw package visibility and customer flexibility as their opportunity to gain market share. The Retail environment was providing a “store like” experience through digital channels. The Construction industry felt that efficiency and visibility to crew activities was a key to improving margins. Manufacturing executives felt their technology was best served keeping internal processes running as efficiently as possible.

Interesting Conversation Notes

In the Financial sector IT leaders felt the customers’ ability to do business remotely was the key to success. Providing secure technology coupled with a stellar customer experience would be what differentiates their offering from the competition. This required a large investment in mobile technologies, security and a fast infrastructure.

All transportation companies referenced FedEx and UPS as technologically sophisticated companies that are dominating the market place. With acknowledgement that FedEx and UPS have obtained large market share through technological advances, the executives interviewed did not seem to have a cohesive plan to compete technologically with these international giants. Others recognized Europe as a growing technological influencer with companies like DPD and GLS investing heavily in the technology space.

Healthcare isn't as advanced as IT leaders hoped but there is a feeling that with more technological investment there could be a higher expectation created, building up competitive advantage.

Question 12: What role will IT play in the next 5 years in your company's evolution?

Interviewees were asked how they felt technology would affect their industry in the next five years. Will it play a larger role in the company's value proposition?

High Level Results Analysis

Responses were put into five categories:

1. Technology will never be important
2. Technology will slightly affect our value proposition
3. Technology will add value but not significant value
4. Technology will be very important
5. Customer in our industry will be lost and won through technology

Every executive agreed to the growing importance of technology in his or her industry with only one executive feeling the change would be only slight. The rest of the respondents felt technology would play a more significant future role in the success of their company and industry. Almost forty percent of the IT leaders felt that technology would be of significant value to their company and industry in the next five years stressing that their success would be directly tied to the value of their technology. This is depicted in figure 17.

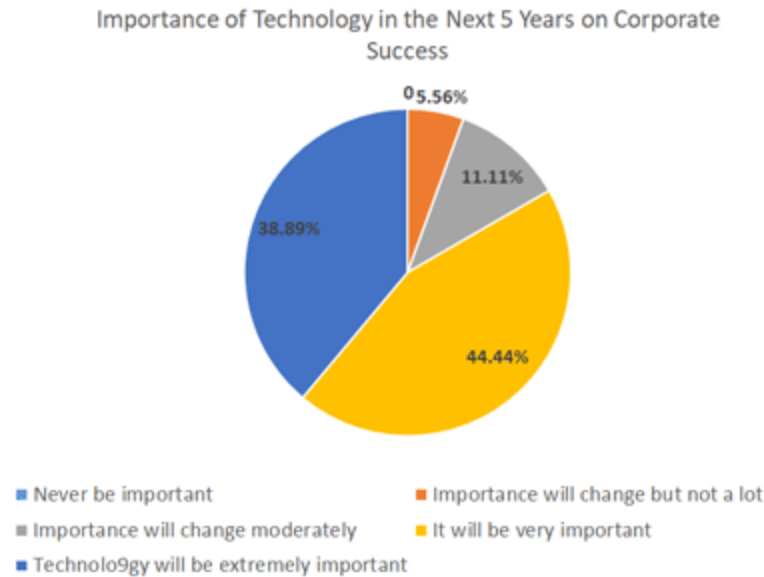


Figure 17. Impact of Technology on Future Success

Discussion Points from Interviews

All executives agreed technology will play a more important role in their companies' ability to compete in the next five years. The level of impact varied from company to company but the majority of leaders felt the impact was very important (almost forty five percent of executives) or extremely important (over thirty eight percent of executives) for a total of over eighty percent of executives feeling technology will be important or extremely important to their value proposition in the next five years.

Each executive highlighted various competitive factors within their industry that technology would provide significant impact over the next five years. Results are represented in the chart below:

Industry	Factor 1	Factor 2	Factor 3
Transportation	Visibility	Efficiency	Flexibility
Construction	Communication	Efficiency	Accuracy
Retail	Experience	Value	Convenience
Finance	Security	Convenience	Experience

Manufacturing	Speed	Efficiency	Flexibility
Healthcare	Value	Experience	Communication

Each IT leader knows the areas where technology would benefit them, and had put foresight into the factors that would affect their viability as a competitive organization in the next five years.

Interesting Conversation Notes

A transportation executive noted that transportation startups are doing very well as they are coming in with a modern technology offering and they are not burdened by legacy systems. They are able to give customers a premium experience at a lower cost. Legacy companies still have a broader customer base but need to move faster to keep up with new entrants into the market place.

Healthcare executives noted that the customer experience today is not as good as it could be, but with technological advances this will change fast. The leaders in this vertical understand they need to change but do not have the funding to make it happen.

Retail is seeing the “brick and mortar” part of their business disappearing. Online shopping is the future. The Retail executives see a reduction in storefront offering by more than fifty percent in the next five years. This puts more stress on technology to offer an experience like a storefront without the building.

Overall the most interesting piece of these discussions stemmed from the idea that four out of five executives feel technology will have impact on their futures success yet, as highlighted in previous answers, there is no foresight into where the industry is going, no investment into these technologies, and no accommodation for these perspectives in the three year plans that have been developed by IT on behalf of the organization. This is a significant gap.

Challenges with the Process

The interviews were very interesting but had some challenges that affected the process. These challenges are documented below as a reflection on my experience for future research endeavors.

Cultural Bias – every company has a unique culture as does a department. Each IT executive interviewed was very confident in their approach to technological development. Some questions became contentious as I was pushing on areas that they had maybe not developed as well as they wanted. It was hard getting succinct answers to questions that brought into question their leadership skills or strategic capabilities.

Integrative Interview Style – the first five interviews were conducted asking the questions as laid out in the ROMEO portal. As information from the first five interviews were consolidated it became clear that a more integrative approach to information gathering was required. Adding multiple-choice questions along with discussion points was much more effective in the interviews proceeding. Consolidation of information also became easier using this method.

Structural Influences – some companies are run by operations, some by finance and some by engineering. These influencers have impact on information technology and their decision-making process. Also, goods-producing industries versus service-producing industries add additional complexities. The influence of IT seemed to be altered by these factors and perhaps should be viewed within this context. It would be interesting to conduct a larger study and focus on these structural influences and their impact on a CIO.

Recommendations for Change in the Process

This section is a reflection on the interviews conducted for this research project highlighting opportunities for improvement for future projects.

The first recommendation is to build questions starting with multiple choices followed by discussion. It was easier to get an executive's perspective through a more linear questioning methodology and then

moving to a more free-flowing answer. This makes it easier to digest information and get a first glance high-level perspective on the interviewee's views.

Insights from Interviewees'

Overall the interview process uncovered a number of opportunities within various industries that drive the Canadian economy. These observations are recorded in the following sections that dive into the heart of the questions asked of the various IT leaders.

Cultural Differences

From the interviews there were many different cultures that emerged from the various IT leaders interviewed. Each CIO had a different environment in which they had to navigate that seemed to affect their ability to be successful in their industry. From a high level, as derived from the interview process, the attached cultural observations were made:

Healthcare had an intense focus on security and the protection of patient data but had a limited budget. The companies seemed to be focused on security at all costs with innovation and productivity improvements as a tertiary thought.

The Financial sector, much like healthcare, had a strong focus on security with strong budget but used their security focus as a siphon on their ability to innovate. Although they had strong funding, the risk of innovation seemed to reduce their desire to invest.

Transportation had a strong desire to innovate and in most cases seemed to have funding to do it. The benefits of productivity improvements were clear to the transportation group however, the culture seemed very risk adverse. The CIOs interviewed, in some cases, condused new investments in commoditized solutions as corporate innovation.

Retail was had good investment but leaned heavily towards “off the shelf” systems. In a few cases these systems were subjected to industry user groups for innovation. New advances did not come without industry consensus. At the same time, each CIO seemed to share similar concerns about their industry and their future.

Construction had investment funding based on operational needs. The CIOs in construction did their best to cater to the operations staff and invested in what operations deemed as valuable. IT Leadership construction took much more of a “follower” role in the company dynamic.

Manufacturing, much like Construction, was taking direction from other parts of the organization. IT leadership was maintaining an environment to support departments like engineering.

There are high level observations from the interviews but paint a picture of the cultures some of the CIO are dealing with in the industries focused on in this study.

Past Influencers on Technology Decisions

The highest investment dollars for the interviewees over the past three years was on infrastructure and security. This focus could be systematic of the CIOs adverse nature towards risk by ensuring the more prudent and obvious investments are a priority. The risk-adverse nature of the CIO was highlighted in a 2014 study by Deloitte that stated, “CIOs can’t shoot from the hip on risky investments. They provide critical services that the business simply can’t do without, where the risk of getting it wrong could be catastrophic” (Ward, 2014). This attitude was prevalent in the discussions with the CIOs conducted for this paper. Over eighty percent of the CIOs interviewed mentioned making investments without risk of failure. Their focus on ensuring success and maximization of budget dollars plays a role in their apprehension for adopting new technologies. It also shows a lack of understanding of development methodologies that prevent excessive budget losses if a technology fails. Creating a test environment to work through technical viability would give these IT leaders an environment to protect investments and

move towards a higher probability of success. Similar methodologies include using the proof of concept, pilot and deploy approach. This a method where leaders make small investments ensuring their concept is sustainable before investing larger amounts of capital. Starting with a minimum viable product, the organization prevents large investment in a technology. The leader then iterates on the innovation through a pilot working out any bugs or unknowns with the new technology or process. Once the technology has been thoroughly tested the leader can move to deployment of the new technology across the platform. Working with proof of concept or pilot phases will allow teams to learn fast from failures and either adjust their approach or abandon a project. This also highlights a need for CIOs to think differently than they have in the past. There is a large factor in how corporate culture plays into the decision- making process of the CIO. At the very least, CIOs need to play an active role in working to change corporate culture and be seen as change agents within an organization. CIOs have a very influential role within the organization; they need to be aware of their roles and push for innovation. With the evolving technological environment and the opportunities this new environment offers, CIOs need to look beyond their comfort zone to create competitive advantage. For every IT leader interviewed, there is consensus that technology will play a bigger role in the years to come; exploring the expansion of new technology needs to be a priority. Without engaging in new technologies, these IT leaders are exposing their organizations to more risk than not making change at all.

Despite the heavy investment in infrastructure and security, the investments in mobile technologies were more promising. Mobilizing the workforce is an important innovative focus for improving productivity for most industries, especially the industries focused on in this research project. The issue with the mobile investment, especially in the transportation interview, was that the CIO responsible for the project saw no innovative impact beyond upgrading the hardware for their company. Mobile investments usually drive productivity improvements. In this case, the IT leader was focused more on the hardware upgrade rather than a more holistic approach to increase overall productivity.

Other influencers on technology also include corporate design. The IT leaders reporting structure had influence on perspectives. Those IT leaders reporting into the Chief Financial Officer (CFO) had a different view from those leaders reporting directly into the Chief Executive Officer (CEO). Technology is playing a more important role in the success of business, which is growing every year. Reporting into the CEO should open CIOs up to a more strategic view of the corporation, rather than reporting into the CFO, which is mainly influenced by cost containment.

Impact of Legacy Systems

From a budgeting standpoint, legacy systems seem to commandeer a large part of the executive's budget. Almost one hundred percent of the executives interviewed mentioned the challenges around legacy systems both from a cost and agility perspective. Historically legacy systems are expensive to maintain and limit the organization from being flexible when adopting new processes. Executives need to commit to upgrading systems through analysis of; risk, value, and complexity, or continue with the existing system in their current environment.

As a note, these legacy systems cannot continue to stifle innovation. Part of the creative process, if an executive continues with a legacy technology, is to integrate new technology into the legacy system. This requires the IT leader to think through different abstraction layers and architectural opportunities that will still allow their organizations to evolve despite an older backend.

Ensuring the right environment for preparing the future is a top priority for IT leaders. IT flexibility and competence to innovate on their business platform has direct impacts on organizational agility in meeting new innovation requirements to support future needs. As legacy systems continue to age, the resources to manage these technologies erode (Ravichandran, 2017).

With these factors in play, IT leaders need to remove the legacy technology excuses from their portfolio either through increased investment in management of the technology or removal of the system from

the environment. In the interviews conducted IT leaders were well aware of the challenges, they just seemed to lack a definitive plan to execute on 'maintain or replace.'

Return on Investment

Return on investment (ROI) was very important for more than fifty percent of the respondents, yet of the executives, who had a lower priority on ROI, there was still little investment in innovation. The struggle between ensuring successful projects and returning a positive ROI was not a factor for half of the CIOs interviewed. Arguably, the industries with a lower tolerance for payback should be leading in innovation in the exploration of new products, services and productivity gains; yet these companies were not embarking on innovative endeavors to any significant extent.

Regardless of the environment, executives need to show innovation has a payback to ensure it is a priority within their company. As the questions progressed, especially by question twelve, the cost of doing nothing seems very high to the future viability of the organizations. Breaking down the paradigm of cost versus value needs to be an initiative IT leaders both understand, and work to make their executive counterparts understand. With companies increasing innovation investments by six percent every year, these Canadian companies need to start investing to maintain future competitiveness (Kolk & Eagar, 2014).

Foresight and Technology

The IT leaders interviewed were not working for organizations that are recognized as technological leaders in their industry. In some cases these companies were small to medium enterprises that did not have the budget to innovate on the same scale as their larger competitors. A number of the IT leaders cited other organizations as leading their industry in technological breakthroughs. In Transportation UPS and FedEx were recognized as the industry leaders. Other IT leaders identified startups as having a competitive advantage as their technology was ahead of their competitors. Being a "fast follower" can have its advantages in business. There is circumstantial evidence to support both ideas of being a "first

mover” or “fast follower” but experts agree change will need to happen eventually for any company (being a slow adopter is not an option). The CIOs interviewed need to take a more proactive view of the future to ensure they are prepared for change. There is a strategic imperative to upgrade technology and compete. The desire to revert back to the core business is a force that needs to be rejected by technology leaders (Antony, 2014). Using tools to understand the possible future realities and building an IT environment to support those futures need to be a priority for IT leaders. The CIOs interviewed can and do play important roles in innovation outside of IT, as illustrated in Doblin’s 10 types of innovation, but for the focus of this research project our discussions centered on IT and their ability to impact productivity.

Changing Role of Information Technology

During the interviews there was little engagement by IT leaders in innovation or innovation teams. In some companies innovation, as described by the IT Leaders, was owned by Operations or Engineering. IT played a small role in the innovative process beyond finding solutions for specific problems as prescribed by the business. Several studies point out that innovation is not owned by one single department, product innovation should include the entire organization. Regardless of the innovative model, Centralized, Decentralized or Federated, IT needs to play a role in the development of future technology (Vinod & Suri, 2015). With the insight of the IT team, and knowing the importance of technology in the future of their organization, IT leaders need to take a more active role in the innovative process.

The Future of IT

Taking into account the comments of each executive leading up to questions nine to twelve, there seems to be a disparity between where their industries are going and their current focus into technology. As stated in the reflections on question twelve, every executive highlighted that technology will play an important role in their company’s future; in fact, over eighty percent said technology will be

either very important or extremely important for maintaining or increasing market share in their respective industries. With this acknowledgment it seems strange there has been no investment or no preparation for this known impending reality. To better prepare for the future, CIOs need to become influencers throughout the various levels of their organizations to push an agenda of innovation on a technical level. This includes developing innovation processes that reduce risk to the organization and build confidence in positive business outcomes. Starting with the CEO, the CIO needs to encourage investment into new technologies that push productivity. This needs to resonate up to the board level. The CIO has typically been seen as risk adverse which adds to the overall corporate culture. CIOs need to be pushing for development into new processes and technology in effort to not only change a company's level of competitiveness but to also help drive a culture shift into a more innovative culture.

The IT leader of the future needs to evolve. They need to be bringing new solutions to their internal and external customers. IT Leaders need to maintain a strong understanding of future technologies while at the same time managing the chaos of change. To bring all this together IT leaders need high emotional intelligence with the ability to bring various groups together in an effort solve complex problems (Lidzon, 2017).

In the previous section it was clear the IT leaders interviewed were not taking a leadership role in innovation. Given the impending reality of technology taking an important role in the future viability of their organization, these leaders need to start visioning out the future and working to maintain relevance in their future competitive reality.

Multi-Future Approach

As mentioned earlier in this research project CIOs need to take a more holistic approach to technology and the impact on their business. Strategies need to be developed outside of IT and in coordination with the business. Too much current focus is put on solving the issues of today, such as infrastructure

and security. There is need to start working towards the business solutions of the future such as mobility and automation. To add, the development of a plan that can vision the future needs of a business to help ensure a company remains relevant during times of radical technological change.

Frameworks have been developed to analyze the macro environment to help guide leaders in determining the possible futures that could face a corporation. A PESTEL analysis may help leaders understand signals of change. The PESTEL framework organizes information collected by a team on signals of change into political, economic, social, technological, environmental and legal categories. The PESTEL framework helps make sense of interdependent trends and signals and identify drivers behind these trends. Rankings of drivers help highlight areas of uncertainty and possible futures that need to be considered for prudent planning. Leaders look at these factors and think through possible scenarios that could affect their strategy in the years to come. Factors can be ranked on probability (high, medium or low), significance (high, medium or low), time (long, medium or short) and effect (positive or negative). Leaders also influencers and actions against the factors listed (see figure 18):

FACTORS	INFLUENCERS	IMPACT ANALYSIS				ACTION
		Prob. (H-M-L)	Signif. (H-M-L)	Time (S-M-L)	Effect (+/-)	
Economic and Financial						
Technological						
Sociocultural						
Political						
Environmental						
Legal						

Figure 18. PESTEL Tool Example

Predicting the future for medium to long term is not possible but there are tools to help guide IT leadership to reduce uncertainty. IT leaders need to invest time into understanding the critical uncertainties of the external environments and need to work to make their strategic plan more resilient to such possibilities. This effort is relevant beyond just IT and a CIO who understands the process would be a great source to collaborate across departments given the impact of technology on all areas of the business. Other tools include scenario development where a leader creates a narrative around possible realities including:

- A Surprise-Free Scenario: Things will continue much as they are now. They won't become substantially better or worse.
- An Optimistic Scenario: Things will go considerably better than in the recent past.
- A Pessimistic Scenario: Something will go considerably worse than in the past.
- A Disaster Scenario: Things will go terribly wrong, and our situation will be far worse than anything we have previously experienced.
- A Transformation Scenario: Something spectacularly marvelous happens – something we never dared to expect.

These tools help build pathways to solutions in the effort to build a more robust strategy (Meimis, 2010).

Recommendations from Interviews

Based on the conclusions derived from the interviews and the research performed on the future IT environment, I would recommend the following actions for the Information Technology Leader of the future.

1. Be less risk averse and focus on technologies that will lead the organization into the future.
Build a strong plan for innovation that includes the following elements:
 - a. Build a plan for innovation (structures and systems)
 - b. Build an innovation strategy in collaboration with other executives
 - c. Innovate with constraints
 - d. Create innovation budgets with clear risk mitigation strategies
 - e. Innovate iteratively
 - f. Innovate with customers
 - g. Fiscal Responsibility
 - h. Innovation processes

Including these elements can reduce risk and allow the interviewed CIOs to move beyond their existing risk tolerance

2. Make a decisive decision on legacy systems. Stay with them or change them but ensure you have architected a solution that is nimble enough to keep up with the impending industry changes
3. Build a process that does not include ROI on prototypes and pilots. CIOs should move into more experimental technologies that help drive the overall value of the organization
4. Where ROI is important ensure that returns are coherent to fellow executives. Some ideas include:
 - a. Articulate precisely your objectives in managing ROI and optimize their execution
 - b. Clarify accountabilities and governance approach
 - c. Take account of cannibalization and the “cost of doing nothing“
 - d. Use consistent logic and match valuation methodologies with levels of risk and uncertainty across the portfolio
5. Attempt to predict the future environment through a multi-futures approach using categories of uncertainty that affect the organization. One of these approaches is explained in the next section. It is important to include this vision into the strategic plan and relate it to the impact on technology
6. IT leaders need to become more engaged in innovation and work with their organizations to develop innovation centres
7. The IT Leader needs to move from Computer Scientist to Visual Artist

Information Technology leaders have a lot of pressure to perform on behalf of their organization.

Throughout the interview process it was evident through the CIO feedback from the questions, there is a need for the CIO to change. The recommendations as stated above are a good first step into helping CIOs change in a positive way towards improved competitiveness. Managing risk to open organizations to more innovative endeavors was a challenge for the CIOs interviewed. Legacy systems also stood as a negative influence for change. Developing an understanding of ROI and how it works with research and development is an important step for corporate buy-in for the argument for change. Finally, helping to reduce risk through reducing uncertainty for the future and rallying innovation teams to help create new realities within a corporation are important to help drive improved global competitiveness.. Pressures will increase, as technology becomes a more important part of a company’s offering with the competitive landscape. The CIO, the business and the culture all need to change to adapt to the new reality.

Evolving Business Needs

As the CIO attempts to keep pace with technology, business needs evolve as well. New science is emerging around customer behaviors and the need for business to adapt. User Experience Design (UXD) has become more powerful in obtaining and maintaining customers for businesses across the world. Understanding users and keeping them engaged is bringing a new level of empathy to the technological world. Design is a very powerful element not only in user satisfaction but also in productivity gains and the reduction of user frustration when interfacing with new technology. Other factors are causing a new focus within business, for example the concept of embracing consumer emotions.

The concept that a brand or company can connect with a consumer emotionally drives loyalty and increases consumer perception of value. This is a concept that is changing the way businesses are viewing their customer base. As businesses attempt to get more personal with the consumer, inevitably the technology needs to follow suit (Magids, Zorfas, & Leeman, 2015).

With the commoditization of technology, other leaders within the organization will become more tech savvy. This is leading to a growth in shadow IT within organizations. Shadow IT is a term that refers to other departments injecting new solutions into a business with specific organization approval (Frank, 2017). In other words, without the CIO knowing. This can work positively for the CIO and organization so long as they adapt in a positive way. The CIO needs to ensure they are receptive to the new solutions and appreciative of the technological understanding of their co-workers. With the distribution of technology understanding and an enhanced requirement by all departments to adapt new technology solutions, the CIO will need to play a more diverse central role in the organization, working as a mediator between the needs of the organization and standardization. These project should be embraced and enhanced by the CIO through their innovative and technologically focused mindset. For this happen the CIO needs to evolve from their current scientific perspective into a more creative mind space.

Moving from Computer Scientist to Visual Artist

As evident in the interviews, the Canadian CIOs interviewed across the different industries have to change in order to ensure the viability of their organizations in the future. Many of the CIOs are very similar to the profile of the computer scientist; they have a strong technical background and they understand the theory and design of systems. As independent systems, and with focus on siloes of solutions, they have been relatively successful in the environment in which they currently exist.

However, during the interviews it was evident the CIOs need to change and that their current philosophies were not sufficient for the future reality – the CIOs know change must occur.

The recommendations from the interviews only take a CIO so far, these recommendations are good to keep CIOs and their companies at status quo for the near future. As mentioned however, the Canadian economy is being affected by a detrimental shift in productivity. To combat this, and to navigate a more turbulent technological future, IT leaders will need to shift their core values more aggressively than their global counterparts if their companies want to remain competitive beyond the Canadian border.

The idea of the CIO as a visual artist does not necessarily mean Canadian businesses need to start recruiting CIOs from art colleges. The focus however for a successful CIO needs to move from a technology based leader to a leader who has a stronger creative capability. Artists have a number of positive attributes and skills that would be highly beneficial to a CIO if successfully integrated into a leader with strong communication, project management and strategic thinking skills. Studies have shown that lack of technical knowledge does not hinder a CIO and in many cases non-technical CIOs are very successful (Cox, 2013). IT Leaders, who are focused on creativity and a willingness to try new innovation in efforts to create customer centric solutions, will have a positive impact in technological improvements. This philosophy needs to also permeate into the education system helping to create future IT and business leaders who have a strong creative capability they can bring to a corporate culture. Educational institutions need to build corporate creativity courses to help educate leaders in IT

in the same way they offer courses in communication and project management. These courses need to adopt some of the fundamental skills of an artist in effort to create a successful environment for IT leaders. Such skills include; awareness of the audience, adaptability and integration, and creativity and innovation.

Awareness of the Audience

Artists are known for their empathy. Their artwork resonates with their viewers because by nature it connects with people's emotions. Understanding the feelings of the users and connecting to their stakeholders through a meaningful interaction is foundational in connecting emotionally with a consumer. To add, with an artist's aptitude for design, the technology will be aesthetically pleasing and adopt strong UXD attributes that reduce user frustration and increase satisfaction. Also, effective design on the interface level can improve both internal and external productivity when users are engaging with systems (Hollis, 2013). There are also further qualitative benefits including; reduction in error rates, user satisfaction, better retention rates, and better user identification.

Adaptability and Integration

Artists must be receptive to criticism; in fact, art critic is an existing profession. Artists take criticism and build on it to evolve their creations. In today's technological world IT criticism manifests in the form of defects, user complaints, complicated training scenarios, reduced user satisfaction, user retention rates and overall perception of the technology; it necessitates the need for bug fixes. Typically bug fixes are categorized into varying levels ranging from critical to trivial. In typical development cycles IT leaders focus on the critical and high-impact bugs fixes, and view the development of their technology in that context. The concept of a defect is extremely linear with prescribed methodology to prioritize and remedy. Prioritization is based on an application's ability to function as intended (Software Testing Fundamentals, 2013). Trivial defects are generally focused on aesthetics and usability however; as

mentioned above these defects are more and more being viewed as of higher importance.

Understanding the constant need for evolution, being receptive to feedback, and seeing defects as more than just barriers that prevent deployment allows for a solution that fits the emotional and aesthetic needs of the user.

Creativity and Innovation

The creativity and innovative spirit of an artist would be the most influential aspect for a leadership role in IT. Artists have a creative flair that allows them to see beyond materials to provide unique creations. Creating distinguishing technological solutions on behalf of organizations is a significant benefit. With the commoditization of information technology, which includes outsourced development and off the shelf products, the technical value of a company will reside in the creative application of these technologies in a meaningful way. How these technologies are used together and integrated in a meaningful way will help drive increased value and deliver new productivity gains for companies. The integration of telematics, mobility and analytics is an example of this fusion, and the applied benefit of enhanced productivity.

This impact will move beyond just the information technology department and the CIO as a productive member of the executive, will help spread these philosophies to other departments. CIOs can have an innovative influence on other aspects of the business as portrayed in Ten Types of Innovation (Uenlue, 2016). These types include:

- Profit model innovation
- Network innovation
- Structure innovation
- Process innovation
- Product performance innovation
- Product system innovation
- Service innovation
- Channel innovation
- Brand innovation

- Customer engagement innovation

A creative mind can open up possibilities beyond technology advancement and work through any of the ten types of innovations listed above.

The artists creativity and innovation goes beyond just the practical application of the technology; it also applies to the strong vision and foresight required to articulate a technological roadmap that will lead a company into the future. This ability to envision a desired end result is an important factor for budgeting and engagement of their IT team to work towards a new future. As seen by the Canadian CIOs interviewed earlier, there is little vision applied to the unforeseen future but rather these leaders are forecasting out what they are comfortable with, such as equipment obsolescence, instead of more complex issues like future customer needs. The interviewees are not contemplating multiple possible futures and they are not building plans that de-risk the most critical uncertainties.

Multidisciplinary Collaboration

As stated at the start of this section, visual artists also need an understanding of technology to be successful in the role of CIO. When the other attributes of an artist, such as awareness, adaptability, empathy and creativity are condensed into a technical leader, the power of the IT team can be leveraged through both the concept of commoditized IT (market available solutions) and in-house capabilities. With a visual artist type of a CIO the IT team members now have a unique direction that can harness their expertise to create new and powerful reality. Augmenting the typical technological skill set within an IT department with the leadership skills of an artist, will create stronger empathetic understanding of the internal and external customer. This collaboration across departments and reaching into the customer through an empathetic backbone and true emotional tie will help increase technological competitiveness within an organization.

The Artistic CIO – Key Performance Indicators (KPIs)

As CIOs evolve to become more creative leveraging the skillsets as described in this research project, there are indicators that will help point to the success of this new model. One of the most important KPIs will be innovation and new advances. Having new skill sets in play, business will see an improvement in moving beyond the current technological environment as uncovered in the interview process. Seeing technology as a canvas instead of a commoditized asset will allow businesses to drive new solutions that will improve their business beyond that of their competition. The next KPI is productivity. Improvements in productivity should be assessed relative to CIO performance. With a more creative mindset, CIOs can implement commoditized technologies in a more integrative way to drive productivity improvements. The final KPI would be increased value to internal and external customers. With a stronger awareness of the audience and focus on design user satisfaction and user utility will drive up the overall value of the technology solutions. These KPIs will have a positive benefit for the Canadian business and ultimately for the Canadian economy.

Impact on the Canadian Economy

The Canadian economy has been subjected to an erosion in productivity relative to other industrialized nations. Canada has fallen several places in the Global Competitive Index. This erosion will be compounded over time as more productive nations continue to innovate and invest in technology. With Canada already taking full advantage of resource quantity through the exploitation of our natural resources, the biggest impact on our economy will be through education and/or technology. Focusing on technology, government investment may not be enough to drive the level of productivity advancements required to propel Canada up through the Global Competitive Index. To add, Canada requires swift action into business change such that the impact of government leveraging a “top down” strategy, where they are dictating the innovation evolution to the business environment will not drive the change Canada needs. The change required to push Canada’s competitiveness on a global scale needs to come from the businesses themselves, as a “bottom up” approach to change. For the impact

of business change to be more effective business leaders need to understand their role in productivity, working with their technological leadership to create an environment that can compete with Canada's global players. Canadian business needs to take a stand and materially affect productivity from a corporate level. With technology continuing to play a more invasive role in the evolution of the business the CIOs role is being changed from a vertical siloed perspective to one that is horizontal spanning across every department and touching internal and external customers. This expanded role and lagging productivity within Canada needs a new focus for CIOs to help Canada compete internationally and drive positive growth of the economy. For this change to occur CIOs cannot continue to manage technology the same way. The macro problem of Canadian competitiveness needs to be solved by a mirco solution through individual business evolution.

CIOs must immerse themselves in a creative background much like they are expected to be more in tune with the business. Canadian CIOs should focus on courses such as sculpture or painting as much as they should focus on communication or leadership skills. Canadian educational institutions should make creative courses part of the curriculum in technology-based curricula and also make artistic competencies part of any leadership course. These are the types of differentiators that will help Canadian technology leaders compete with their global counterparts, who already have a productivity advantage. The Canadian CIO needs to evolve faster in order to compete. This means revolution, not evolution. Canadian companies need technology leaders that create unique and innovative solutions that affect Canadian business driving a new level of productivity. With the commoditization of IT the real challenge isn't the technical "know how," it will be focused on the creative ability of the new IT leader. Harnessing the talents of an artist to lead the IT vision can have positive impacts on the evolution and application of technology to improve productivity at a rate that is more extensive than that of the current global CIO. If Canadian CIOs can get past the technical paradigms of the present and

look to be the technology artists of the future, the Canadian economy could reach a new level of success in the Global Competitive Index.

Conclusion

As the technological environment evolves so must the executives that lead it. The challenges of the past will be much different than what faces the company of the future. For IT leaders to confront this new reality they must be appropriately equipped. As technology becomes more available and evolves into a more commoditized state, the need for IT Leaders to be focused on the technical side of the business becomes minimized. The technology skills they learned become quickly obsolete as new programming languages are adopted. Instead, IT leaders need to be focused in other areas; they need to take risks moving beyond what past experience has taught and move into a more exploratory mindset. IT leaders need to take a lead role in exploring the value of technology to both internal and external customers through new solutions and a more creative integration of these new technologies. CIOs should be encouraged to enroll in courses such as painting or sculpture to enhance their creative skillsets. The development of this trait (the creative brain?) in Canadian CIOs can open a new level of capability. This infusion of exceptional creativity, design and innovation will compliment an existing technical team that operates in the information technology department creating a strong multidisciplinary collaboration that will propel Canadian business into a more prosperous economic position on a global scale. The modern Chief Information Officer needs to evolve from a computer scientist to a visual artist viewing technologies as more than a binary solution; instead as a canvas in which they can paint a new reality.

Further Research

There are further research opportunities that relate to this major research project (MRP) that should be investigated by researchers. If this line of research were to continue some further opportunities would include: correlating visual artist competencies with that of a strong innovation leader, evaluating how to best develop integrated learning environments that infuse visual arts with technology related

courses, linking business maturity with business culture in effort to explore other levers that can improve innovation. Additional ideas include the impact of current impact of government funding on innovation and other opportunities to improve Canada's global competitiveness by including factors such as productivity improvements.

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Appendix A – Interview Questions

Interview Questions

1. Over the past 3 years, what have been the top IT investment areas in your company? Please rank in order of investment/focus:
 - a. Infrastructure
 - b. Software
 - c. Mobility
 - d. Automation
 - e. Security
2. What is the driving factor for your company's investment focus for IT? (what has your company ordered the investment the way it has?)
3. Over the past 3 years have you seen an increase or decrease in technology investments?
 - a. If it exists, what would you attribute the investment increase/decrease to?
4. How important is Return on Investment (ROI) on your IT decisions
 - a. What technology does ROI apply to?
 - b. What technology does ROI not apply to?
 - c. If IT projects need an ROI, how has your IT department done meeting the ROI objectives
 - d. For ROI, in the last three years, has the focus been on cost reduction (efficiency) or revenue improvement?
5. If your organization increased your budget by 10% over the next 3 year, where would you spend it and why?
6. Does your IT team have a strategic plan?
 - a. How was the plan developed?
 - b. Did you engage across the organization?
7. How far out, in a matter of years, are your IT decisions?
 - a. How do you make these determinations?
 - b. How often do you reassess your foresight initiatives?
8. In two sentences, how do you describe the role of IT in your company?
9. What role does innovation play in your company?
 - a. How do you find/solicit/expose innovative ideas?
 - b. How are innovative ideas rewarded/acknowledged?
 - c. What role do your vendors play in innovation?
10. How much of your budget is allocated to innovation or testing the unknown?
 - a. Do you have any internal processes for innovation and development?
 - b. Who in your organization is involved?
11. What is your differentiator relative to your competition?
 - a. How are you maintaining differentiation over the next 3 years?
12. In five years what will your company be like and what role will IT play in the new transformation or in the status quo?