The Process for Adopting Technology in Ontario Municipalities and the Implications for Innovation in Development

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

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ABSTRACT

The purpose of this thesis is to provide a stepping stone for technological innovation in the development control process. As a foundational piece of research on this topic, it leverages classic technology adoption theory alongside an investigation of how municipalities adopt innovation for tools of planning, such as geographic information systems.

This thesis provides a qualitative analysis of opportunities and barriers to the potential for the adoption of an online development control process, investigating satisfaction with the current process, perceptions on potential aspects of innovation within the process and willingness to adopt. The survey conducted revealed a gap between perceived versus actual satisfaction with the current process, conflicting views between municipal and consulting planners, and a strong overall interest the ability to submit development control applications online.

This paper found that perceived barriers such as complacency with the current system can be overcome when confronted by innovation; however barriers including capital cost investment are real and require further consideration in the adoption process. Findings from this thesis point to a strong willingness for innovation of the process, especially the conception of an intuitive online development control process.

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This thesis was borne from a combination of my creativity, curiosity, determination and general refusal to accept things as they are, simply because they have always been that way. I would like to thank my parents for supporting these traits from an early age and channeling them towards a career that I am both passionate about, and proud to be part of.

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Finally, I would like to thank my brother, David, for always believing in me and providing never-failing encouragement in all aspects of my life, even from across the continent. Thank you.

"We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run."

- Roy Amara, former president of The Institute for the Future

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CHAPTER 1 - INTRODUCTION

Urban planning provides an organized and agreed vision for the future of development. It is a technical exercise in composing settlements as well as a political process with multiple and often conflicting stakeholder interests. In order to achieve this daunting task, municipalities, under the direction of the Planning Act, create an overarching master-planning document: the Official Plan. While this plan may have different names across different provinces and regions, its intent is unchanging. It is used to prioritize long term goals as well as guide development and infrastructure decisions on topics such as land use, built form, transportation, and the environment. Municipalities within a regional governmental structure must ensure this document follows the Regional Official Plan. The Zoning By-law is a detailed companion document and control mechanism to regulate specifics and associated requirements for instance, setbacks and parking. (Quinte West, 2012)

As technology has evolved, predicting and planning for this future has become increasingly complex. Computer modelling based on census data is used to predict trends in population and employment growth, paired with current plans for development. Previously, aerial photos and paper maps were tools of the trade, now replaced by Google Earth, Google Maps and Geographic Information System software. These advancements have created many opportunities for municipalities to plan in a more accurate and detailed fashion.

One of the most frequently used processes by any planning department is development control. For example, the Province of Ontario, through the Planning Act, determines how the development review process is to be undertaken, how land uses may be controlled and by whom. The Planning Act gives the power to process Official Plan Amendment applications, Zoning By-law Amendment applications, Plans of Subdivision, and Condominium Development applications. (Quinte West, 2012)

Various committees can be involved in development control such as a Planning Advisory Committee, Property Standards Committee, Site Plan Control Committee and the Committee of Adjustment. Their roles are to express recommendations and function as a liaison for the development industry, governmental agencies and the public. (Qunite West, 2012)

Development control can be a time consuming process for applicants, and while the data, visualization and mapping subsets of urban planning have embraced advancement in technology, process driven functions have remained largely unchanged. Development control remains a largely paper-based process, with planners available only during office hours and the requirement that either the applicant, or counsel to submit in person. The back end of the process is also outdated and relies on planners to keep track of payments for applications as well as paper files from the building department.

The popularity of online mapping applications, such as Google Maps and Google Earth with those both inside and outside the planning industry should serve as inspiration. There is a clear interest and growing market for improved technology to do with the geography and understanding of our urban spaces. Municipalities have responded by

creating tailored GIS applications to provide interactive mapping opportunities to their residents. These web-based applications such as the City of Kitchener, Ontario's "OnPoint" allows the user to search for active zoning, site plan, or plan of subdivision applications, investigate which Ward of the City they belong to, or view a zoning map overlay. (City of Kitchener, 2013) Though these applications are often clunky, lacking finesse and an intuitive user interface they remain popular and a staple of the municipal website experience.

This growing attraction of interacting with your city in a spatial context spawned this study of the process for adopting technology in Ontario municipalities and the implications for innovation in the development control process.

1.1 Research Questions

For the purpose of this study, the research questions are as follows:

- What are the opportunities for innovation within development control?
- What are the barriers to innovation within development control?
- What is the role of technology in addressing these opportunities and barriers?

The purpose of this quantitative study is to assess the potential for the adoption of technological innovation in the development control process in Ontario, Canada. The objective is to better understand perceptions on the adoption of technology from professionals in the development community, as well as their experience with the development approvals process and potential opportunities and barriers to adopting technology within that process. Firmly understanding these perspectives on both

technology and the development process is crucial to the success of this research and the goal of identifying factors that could be addressed to offer recommendations for adoption.

In this study, the targeted users for online development control are planning and development industry professionals who interact with the current process. While municipal planners will most definitely be using the same software, the streamlining of the process furthermost directly affects and assists those making the applications from the front end. Creating a user interface aimed at those not intimately acquainted with planning processes works to set a standard that eliminates unnecessary complication in the back end of the software as well.

The significance of this study lies in the hope of achieving a better delivery of a fundamental planning process, making it more efficient, faster and with fewer barriers, such as time commitments, experienced by municipalities, developers and the public. Creating an easier to use system that can be accessed from anywhere at any time will help to build positive relationships and will minimize delays. As well, streamlining the process from the municipal planning department's perspective reduces the chance of human error in dealing with applications and building files, as well as saved resources. This study could also serve as a gateway for the adoption of other online planning applications to increase accessibility and efficiency across the industry.

This study will focus on surveying professionals involved in the planning and development profession to gain individual rather than organizational viewpoints on the uptake of innovative technologies within the development process. Results from the survey will aim to support recommendations and conclusions on the potential for innovation

within the process function of municipal development. Surveying the breadth of professionals that interact with the process will help to form a fulsome picture of opinions towards innovation, as well as provide insight into any differences between those inside the process, such as municipal planners, and those outside the process.

1.2 Thesis Structure

This thesis is categorized into six chapters. The second Chapter focuses on establishing a framework for understanding technology adoption; in theory, in practice, and specifically in the planning and development industry. Chapter 3 expands on the methodology of this study including data collection and sampling methods as well as limitations to this research. Chapter 4 examines the results and discusses broad trends and findings. Chapter 5 concludes this study, while Chapter 6 outlines recommendations brought forth from the findings as well as for further research.

CHAPTER 2 – LITERATURE REVIEW

2.1 Introduction

Initially, research for this study looked at technology and innovation within the planning industry, subsequently investigating integration and perception. As previously discussed, literature regarding technology in planning is largely related to PSS and GIS use. To supplement this, research into information and communications technology (ICT) will serve as a basis for understanding fundamentals of technology. Furthermore, an exploration of the process of technology adoption is crucial for consideration of technology adoption techniques in municipalities.

Since there isn't necessarily a precedent for how online development control is implemented, literature relating to GIS and PSS systems will be used as a benchmark and will be applied to online development control applications. This is to be paired with literature focusing exclusively on the theories of technology adoption in individuals and how individual innovativeness affects the adoption of technology in a population such as an organization or corporation. Non-planning specific technology adoptions will also be looked at in order to broaden understanding of trends while relating directly to the purpose of this study.

2.2 Theories in Adoption of Technology

2.2.1 Diffusion Theory

The theory of technology adoption has been widely studied, perhaps most famously by Everett M. Rogers, who developed the theory of Diffusion of Innovations and coined the term early adopter. (Singhai, 2005) Rogers based this theory largely on a 1943 study out of Iowa State University by Ryan and Gross. This study, rooted in rural sociology, "provided the genesis of modern diffusion research…us[ing] interviews with adopters of innovation to examine a number of factors related to adoption." (Surry, 1997, p.2) The interview-based methodology used in this early study remains one of the prevailing diffusion research methodologies to this day. (Rogers, 1995)

However, recently there has been some discussion whether particular fine grained details of Rogers theory holds true in today's ICT environment. "Diffusion theory can still be valuable framework for the study of adoption diffusion, on the condition that there is some necessary reorientation concerning the shape of diffusion patterns, segment profiles and adoption determinants." (Lieven De Marez et al, 2011, p.197) To define diffusion theory, one must take these conditions into consideration and distill the various definitions of diffusion. For the purpose of this study, in its most elementary form, diffusion is defined as the means by which a product or innovation is taken up by a population. (Surry, 1997; Rogers, 1995; Lieven De Marez, 2011; Onsrud and Pinto, 1993)

Rogers discussed several theories; however four of them (1) Innovation Decision Process, (2) Individual Innovativeness, (3) Rate of Adoptiveness and (4) Perceived Attributes are among those most widely used as a basis for diffusion, and are condensed in the following table. (Table 1, p.8)

Table 1 - Theories of Technology Adoption

Innovation Decision Process		Individual Innovativeness	Rate of Adoptiveness	Perceived Attributes
Diffusion occurs over time		Certain individuals are predisposed to being innovative	Innovations are diffused over time in a pattern that resembles an S-shaped curve	Potential adopters judge an innovation on their perceptions of 5 attributes
5 Stages	(1) Knowledge	Innovators are risk takers, pioneers, will adopt very early	Period of slow, gradual growth	(1) Trialability
	(2) Persuasion			(2) Observability
	(3) Decision			(3) Relative Advantage
	(4) Implementation			(4) Complexity
	(5) Confirmation			(5) Compatibility
		Laggards will resist adopting until later, if ever	Followed by period of dramatic and rapid growth	An increased rate of diffusion will occur if potential adopters can:
			Followed by stabilization, and eventual decline	(a) Try the innovation on a limited basis before adoption
				(b) Realize observable results
				(c) See an advantage compared to other innovations or business as usual
				(d) Perceive the innovation as simple
				(e) Compatibility with goals and values

(Surry, 1997; Rogers, 1995)

While it is not noted in Surry or Rogers' research, for the purpose of this report it is important to anticipate that stabilization and eventual decline of an innovation can be slowed or avoided by several intentional factors, including staged implementation phases of the technology.

Similarly, the speed of this take up, or adoption, is influenced by a multitude of factors both inside and outside control of the innovator. "The four major factors that influence the diffusion process are the innovation itself, how information about the innovation is communicated, time, and the nature of the social system into which the innovation is being introduced." (Surry, 1997, p.1; Rogers, 1995)

As mentioned earlier, while Rogers' theory of diffusion has been the long undisputed golden standard in technology adoption theory, it must be constantly weighed against the changing climate of technological advancement and considered particularly when innovations fail at adoption, pointing most notably towards the failure of early adoption.

> "Irrespective of the cause of these market failures, whether it be the multitude of innovations and features overwhelming users with 'too much too soon' (Sutherland, 1999), a lack of accurate prior-to-launch insight (Carayannis et al., 2003) or inefficient introduction strategies (Ottum & Moore, 1997, Roberts et al., 2005), adoption rates often stay far below the predicted patterns while 'an abundance of ICT-innovations is constantly struggling for market acceptance' (Waarts et al., 2002: 412)." (Lieven De Marez, 2011, p.176)

2.2.2 Rate of Adoption

According to Rogers' Innovation Decision Process, the process of diffusion has five distinct stages; Knowledge, Persuasion, Decision, Implementation and Confirmation.

"Potential adopters of an innovation must learn about the innovation, be persuaded as to the merits of the innovation, decide to adopt, implement the innovation, and confirm (reaffirm or reject) the decision to adopt the innovation." (Surry, 1997, p.3)

Identifying early adopters and individual innovativeness in the targeted community is crucial to achieving widespread adoption and underscores the importance of first having a solid understanding of how users and individuals view adoption as a basis for corporate or organizational adoption. "Innovators are the risk takers and pioneers who adopt an innovation very early in the diffusion process. On the other extreme are the Laggards who resist adopting an innovation until rather late…if ever." (Surry, 1997, p.3)

In order to identify these early adopters and understand the rate of adoption, it is useful to grasp the full range of philosophical views on technology innovation. (Table 2, p.10) These views can range from the radically opposing facets of deterministic beliefs; agreeing that technology is self-governing and revolutionary, and conflicting completely on their opinion of technological morality, to the more real-world based instrumentalist theory. (Surry, 1997) "Utopian determinists believe that technology is a positive and uplifting force that will, over time, mitigate or eliminate most or all of the ills that afflict humanity. They believe technology is leading society towards an ever more utopian existence" (Surry, 1997, p.5)

Table 2 - Philosophical Views of Technology Innovation

Utopian Determinism	Technology is an inescapable, self-governing force that will give rise to prosperity and the salvation of society
Dystopian Determinism	Technology is an inescapable, self-governing force that is morally bankrupt and will lead to the abolition of society
Instrumentalism	Technology is developed and controlled by society and its use can have constructive or catastrophic ramifications
	(Surry, 1997)

Dystopian determinists, on the other hand, root their views in the fact that technology is intrinsically evil and that the downfall of morality, intellect and society is not far behind technological innovation. George Orwell famously illustrates this dystopian determinist attitude through his fictional masterpiece, *1984*. (Surry, 1997)

Another perspective on philosophical viewpoints of technology is to separate the developer from the adopter. Developer based theories are largely determinist while adopter based theories are rooted in instrumentalism.

> "The underlying assumption of developer based theories is deterministic in its belief that superior technological products and systems will, by virtue of their superiority alone, replace inferior products and systems. Developer based theories of diffusion see change as following directly from a technological revolution." (Surry, 1997, p.7)

This perspective champions the idea that the greatest path to technological change is by creating a considerably superior method or product to what currently exists, and that this fact alone will force adoption as "technological superiority is a sufficient condition that will lead directly to the adoption and diffusion of innovative products and practices." (Surry, 1997, p.7)

Criticizers of this perspective point to its pro-innovation bias as a blind spot in real-world adoption of technology. This is exemplified year after year as the number of high-tech start-ups claiming superior technology grows exponentially, yet they are plagued by slowness or adoption and accompanied diffusion, then waiver and eventually fail. (Lieven

del Marez, 2011; Moore, 2006; Slater & Mohr, 2006) The linearity of developer-based assumptions in adoption lack the required consideration of both circumstance of use and end-users, but just as importantly, non-users. (Lieven del Marez, 2011)

On the contrary, adopter based theories focus on the end user as the primary force of change as they are manifestation of the innovation in the real world. "All structures and machines, primitive or sophisticated, exist in a social context and, unless designed for the sake of design itself, serve a social function." (Segal, 1994, p.2) Therefore, adopter focused theories are intrinsically instrumentalist in nature as they pursue the social framework in which the improvement will be used. (Surry, 1997)

As adopter based theories are more rooted in the reality of the everyday use of a particular innovation, they account for underrepresented hurdles in the adoption process. They reject the concept that technological superiority is the sole determining factor in adoption. A timeless example is the QWERTY versus Dvorak keyboard layout.

> "The Dvorak keyboard configuration is superior and allows for more efficient and faster typing. However, since most typists learned to type using the QWERTY configuration and are comfortable with that configuration, there is great reluctance to adopt the Dvorak configuration, despite its superiority. This is a classic example of how human, interpersonal, and social factors play a significant role in adoption than technological superiority." (Surry, 1997, p.8,9)

This underrepresented hurdle is described by Tenner (1996) as the Revenge effect. While malicious in nomenclature, and to some degree in practice, the Revenge effect is seen, such as in the QWERTY versus Dvorak example, when a new product or innovation functions in an unforeseeable way once it is used in a real world setting.

It is crucial to understand theories of how early adopters think as their individual decisions affect overall adoption and signal context that may be overshadowed at a broader organizational level. "These critical approaches suggest that the adoption and use of technology are part of a more dynamic process … they are context-dependent. The decades old assumptions of diffusion theory are still a fundament for a diversity of research in an severely changing ICT environment – albeit in a scattered and increasingly contested way." (Lieven Del Marez, 2011, p.179) In this vein of understanding the philosophies of adopters, it is equally important to understand who they are.

2.2.3 Adopters

Rogers created the first break down of adopters of technology in his diffusion theory, making the basic assumption of a symmetrical, bell-shaped pattern of five adopter segments with relatively fixed sizes. (Figure 1, p.14) Innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%) and laggards (16%) are noted. Innovators are assumed to be profiled as young, male, affluent, urban and open minded. On the opposite end of the spectrum, laggards are assumed to be socially and geographically isolated older persons lacking both the curiosity and monetary resources to adopt new technology. (Lieven De Marez, 2011; Parasuraman and Colby, 2001)

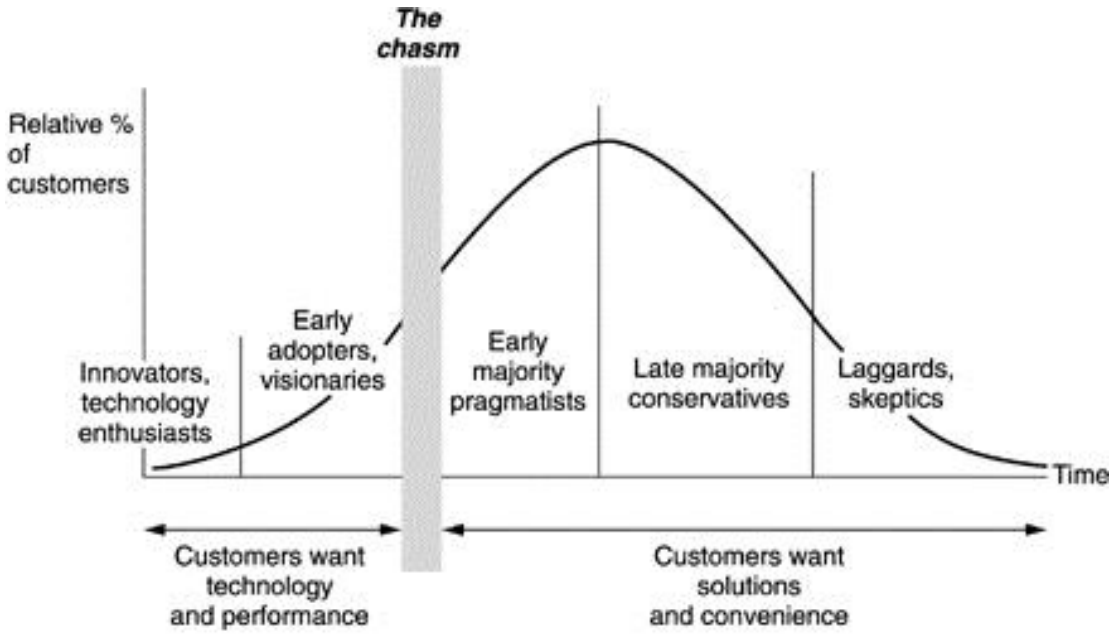

Figure 1 - The Adoption Curve (Searls, 2003)

Some innovators have found there to be a distinct issue in reaching the early majority phase of adoption, citing a "chasm". (Figure 1, p.14) While this may be proof of the adopter based instrumentalist theories, Rogers has denied such an impasse and proclaimed that "pronounced breaks in the innovativeness continuum do not occur between each of the five categories, although some scholars claimed that a discontinuity exists between the innovators and early adopters versus the early majority, late majority and laggards. Past research shows no support for this claim of a "chasm" between certain adopter categories." (Rogers, 2003, p.282)

However, an example can be seen in the adoption forecast (Figure 2(A), p.15) and year-by-year percentage growth (Figure 2(B), p.15) versus the actual yearly adoption rates of 3G and DTV technology. "The comparison between the forecasted and the actual diffusion patterns derived from data provided by the operators (until Q4 2009), show

striking similarities proving the predictive validity of a methodology (PSAP) that is not blindly based on the diffusion theory's assumptions regarding fixed segment sizes." (Lieven del Marez, 2011, p.184)

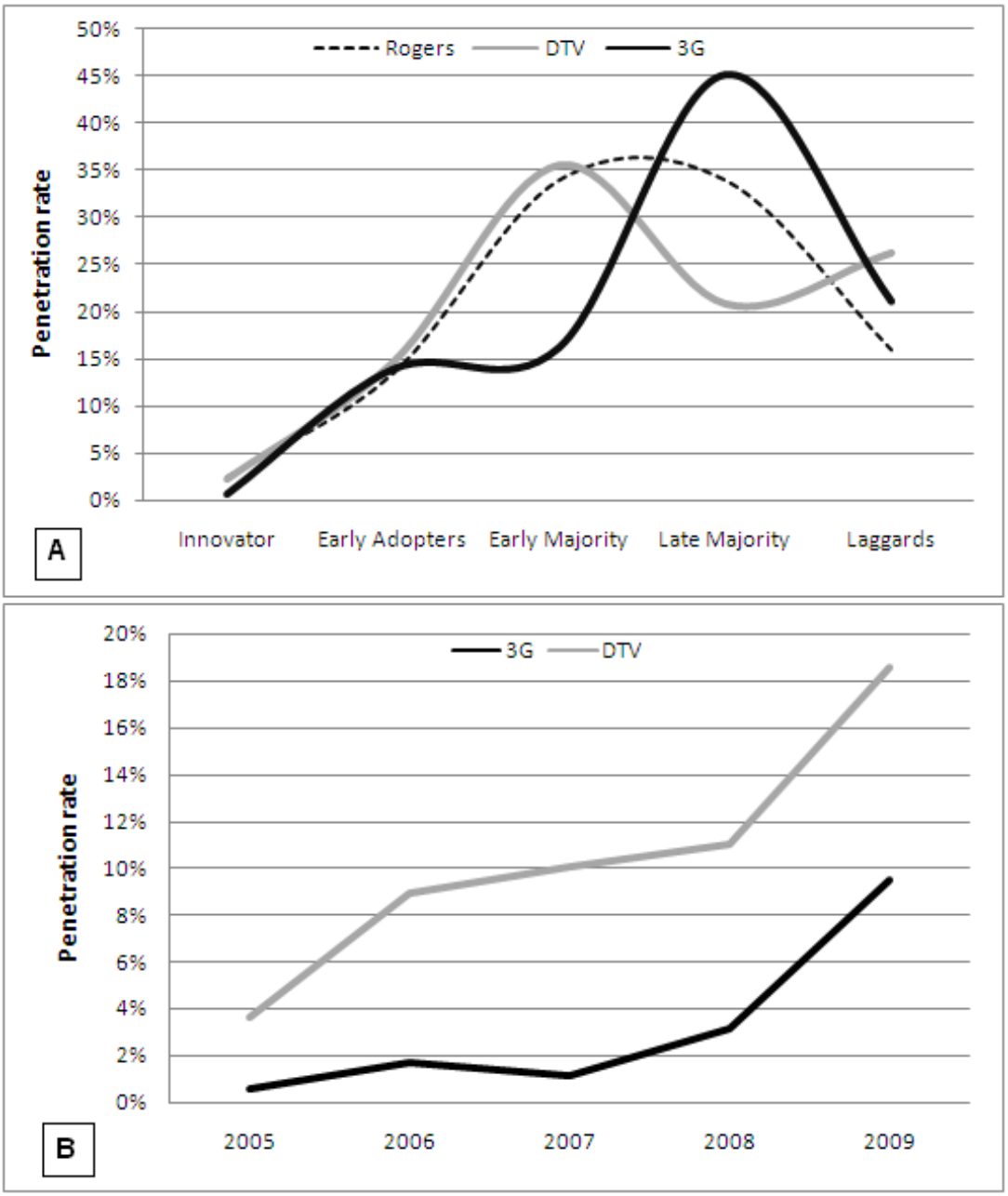

Figure 2 - Adoption Forecasts versus Reality (Lieven del Marez, 2011)

The argument against Roger's diffusion theory centres on the fixed assumptions of the five adopter segments, noting that the typology of the segments remain respectable and dependable, however diffusion estimates based on fixed segment sizes could prove to be deceptive. "Criticisms on this assumption of continuous linearity and symmetry already induced pleas for more flexibility in pattern and segment size assumptions (e.g. Goldenberg et al., 2006), but the bell-shaped curve covering 100% of the population divided over five segments with fixed sizes remains a basic assumption for many studies." (Lieven del Marez, 2011, p.181)

For the purpose of this study, it should be understood that the classic bell-shaped adoption curve will be considered along with Rogers' assumptions of characteristics of adopter profiles, for example that young men are predisposed to be innovators. However, taking into account the significant changes to the ICT environment over the past decades, consideration will also be given to adopter based theories to provide a well balanced approach to identifying early adopter characteristics. Rogers' diffusion theory serves as an important basis for comprehending the penetration pattern of a potential innovation and adopter based instrumentalist theory will provide insight to the real world usage and social context of adoption. (Lieven del Marez, 2011)

2.2.4 Paths to Adoption

The social context of adoption is more important now than ever before. The pace of adoption has steadily increased over the past century, leading some to believe this quickened uptake is inevitable. Horrigan (2010) notes in his paper *Adoption Paths: The*

Social Forces that Shape the Uptake of Technology, a remark by Google founder Sergey Brin that perfectly captures this notion. "When asked if he thought lack of computer access for low income kids was a problem, he minimized the worry, saying that the internet will eventually be like electricity: "cheap and easy" (Olsen, 2008)." (Horrigan, 2010, p. 2) He goes on to describe the pillars of technology adoption. (Table 3, p.17)

Table 3 - The Pillars of Technology Adoption

Infrastructure	Especially important if there is a network component
Sustained Innovation	Results in eventual lower costs to adopters and progression in functionality
Social Support	To support the "demonstration effect" that potential adopters experience when those within their social network are adopting or using something new

(Horrigan, 2010)

The widespread use of online social networks has accelerated and exacerbated the effect of this third pillar, social support, largely driven by individual decisions to adopt. The concept is simple. People trust others within their social circle and learn about new products from the people around them. The social network has become a vital aspect of potential adopters discovering the value and functionality of an innovation. (Horrigan, 2010)

While these pillars cannot stand in isolation as they are integrated and codependent, acceleration of one often leads to acceleration of consumption as a whole. The rate at which infrastructure, sustained innovation and social support have grown in the past 100 years is exponential, and so is its effect on consumption. This can be seen when examining the uptake rates of various innovations over the past century. (Figure 3, p.18) ; (Table 4, p.18)

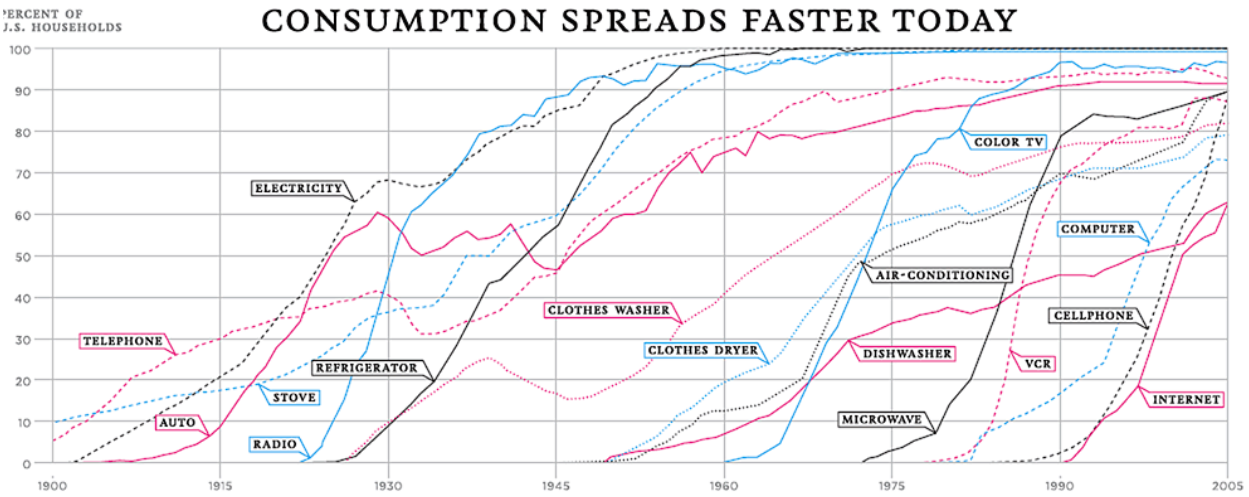

Figure 3 - Rate of Technological Adoption Through Time (Felton, 2008)

Table 4 - Years it took for Innovation to Reach 50% of American Homes

Telephones	71
Electricity	52
Radios	28
Personal Computers	19
Colour Television	18
Cable Television	15
Cellular Phone	14
VCR	12
CD Player	11
Broadband	11
Internet Access	10
	(Felton, 2008)

The rapidly increasing uptake of innovations across American households is indicative of trends across developed countries such as Canada. This is in part due to standing on the shoulders of giants, so to speak. Colour TV was able to build on the precedent of black and white television sets and did not need to present a case for value. It was simply better. This deterministic approach to innovation clearly worked.

> "It is difficult to determine what factors mattered most or how rates of adoption might have changed had one pillar been weakened. Infrastructure build out was certainly supported on multiple fronts in the early telephone and electricity industries. Private capital drove construction of the early telephone network and, as growth of multiple competing networks proved problematic due to interconnection problems, government policy facilitated consolidation in the industry. That, in turn, fostered additional investment and consumer adoption." (Horrigan, 2010, p.5)

The ability to piggy-back on preceding investments in infrastructure in concert with the proven value of previous iterations of an innovation, paired with the expansion of social networks, paves the way for increased rates of adoption across all industries.

Perhaps most importantly, this social aspect cannot be underscored enough, especially in the context of today's innovation environment. For example, Horrigan (2010) points out that Alexander Graham Bell believed that his invention, the telephone, was building on the popularity of the phonograph, and would be most useful to gather people together to listen to music played somewhere else. It soon became evident that the telephone was being used, especially by women and rural Americans, as a tool for social visiting. The industry had to play catch-up as it was originally marketed as a tool for business or emergency. "For at least a generation, there was a mismatch between the uses people had for the telephone and how industry thought the telephone should be used.

Fischer (1994) argues that this disconnect has to do with industry's initial vision of the technology as a practical tool." (Horrigan, 2010, p.6)

This mismatch is evident today in planning as well. There is a disparity between traditional GIS and its use as a serious, business tool that requires significant training and expense, and the desire of the public to use spatial tools to explore their city by sandboxing. Similarly, there is currently a very limited social aspect to GIS, and this latent demand is increasingly valuable as a marketing tool for innovation in the development industry. This reinforces the social aspect currently missing in the process of development.

Horrigan (2010) synthesizes his findings in three major implications for policy regarding social forces that influence technology adoption. The first is to nurture social infrastructure, especially in terms of non-adopters in order to broaden and sustain adoption. Secondly, to cultivate it at a local level and build off of the trust of established social networks. The final recommendation is to plan for technological change in a predictable and streamlined fashion, preparing for the inevitable continuation of innovation without alienating late adopters along the way. While this is true for individuals who are late adopters, it may also be true for organizations, as not all municipalities may have the resources to become early adopters..

2.3 How Municipalities and Organizations Adopt Technology

2.3.1 Benchmarks for Adoption

Research into innovative technology adoption in planning yielded results centering on Planning Support Systems (PSS), Geographic Information Systems (GIS) and Spatial Data

Infrastructure (SDI). While these are not necessarily directly related to online development control applications, understanding different, yet parallel technologies in planning is helpful to understanding the landscape of innovation within the industry.

GIS is defined in many ways. In its most basic form, it is a software system that captures, incorporates, stores, revises, retrieves and displays spatial data. (Clarke, 1986) ESRI is a leader in GIS software. Their product, ArcGIS is the standard for students, municipalities, and GIS professionals.

> "A 'geographic information innovation' … could consist of a sole hardware/software combination, a broad range of commercially developed or in-house developed geographic information processing capabilities, a unique and useful data set or database method, a standard for data collection, and combinations of these." (Onsrud and Pinto, 1993, p.19)

GIS provides a platform for planners to visualize data to interpret trends, relationships and patterns that may otherwise have not been easily revealed. This includes not only mapping where things are, but the quantities, densities and change over time of a number of variables. (ESRI, 2013) GIS also allows the user to decide what arrangement the output of analysis takes in order to manipulate the data into the form best suited to clearly displaying the observed trends and relationships.

While similar, PSS is markedly different and can be understood as the following:

> "Computerized planning support systems are a sub-class of decision support systems (DSS) that serve a special purpose, assisting a person in completing planning analyses and tasks. Some general planning tasks that can be supported using software and computerized systems include gathering planning relevant information, evaluating courses of actions, preparing plans and monitoring results and evaluating contingencies." (Power, 2004)

These PSS systems have certainly advanced modeling and analysis in planning, but as Power (2004) points out, the intended user of a planning support system is a planner.

There is some literature on PSS as a tool for those other than planning professionals, such as a platform for conducting public participation, as in the case of Ligtenberg (2010), who examined the use of a planning support system named SimLandScape based on using 'sketch planning' to communicate a design process. While SimLandScape was program based, MetroQuest is a PSS tool developed as an online application that focuses on stakeholder engagement and bridging the gap between the general public and decision makers. (MetroQuest, 2013) Though ESRI is innovating and incorporating features such as real-time GIS and 3D modeling in CityEngine, location analytics and strengthening their analysis tools, and MetroQuest speaks to public participation in municipally driven projects, there is still a gap in providing an online platform for grass roots urban development available to the public.

Kammeier describes the state of modelling and PSS software from the 1960s through to the late 1990s and provides a necessary and interesting insight into the history of PSS development. Though it is evident that the technology scene has drastically changed over the past 24 years, two centrally important themes emerge. The first theme addresses new software that aided in spatial decision making, a ground breaking achievement at the time. The second theme goes on to explore the role of PSS.

The first successful computer applications were built out of the need to cope with transport and traffic management issues. Kammeier (1998) also outlines where software and PSS could be useful in both substantive and procedural planning processes, but does not specifically mention development control.

The Royse et al (2008) piece, *The modelling and visualization of digital geoscientific data as a communication aid to land-use planning in the urban environment: an example from the Thames Gateway* discusses the use of technology and the benefits it provides in all aspects of planning. The focus on providing information that is accessible, relevant and most importantly understandable can be related to adopting online development control that is intuitive and easy to use. Additionally, Royse (2008) believes providing innovative ways of visualizing and communicating complicated data and information to the public, and to other professionals, is key to advancing the accessibility of information.

> "Data-users can be divided into two camps, 'thick' and 'thin' (Turner 2006). Traditionally, geoscientific information has been provided to 'thick' clients. 'Thick' clients are those who are happy to interpret and manipulate raw data; typically they are

> keen to have large quantities of uninterpreted data (e.g. academics). 'Thin' clients, in contrast, desire simple, concise data that answer precise questions (Turner 2006). 'Thin' clients make up the majority of planners and developers. This view was supported by Culshaw (2003), who suggested that academic users were no longer the most important users of geoscientific information. Therefore, if geoscience data are going to be used widely within the land-use planning sector, geoscientists need to rethink, radically, the way geoscientific data are presented and visualized." (Royse 2008, P.91)

In the context of online development control, this is a fundamental concept. The 'thick' users of development control could be considered the municipal planners, who arguably have a detailed working knowledge of planning terms, expectations and the process. 'Thin' users could be described as developers, builders or individual home owners. Taking this into account during the user interface of online development control could work to address barriers relating to knowledge about the process. The difference of opinion between 'thick' users (municipal planners) and 'thin' users (developers, builders) on aspects of the development control process is paramount to understand through this research.

One of the inspirations for this study revolved around the use of paper building department files that often serve as the institutional record for previous applications and the history of each parcel of land within the municipality. Carreira (2007) touches on this,

examining the costs of efficiency lost and potential problems with professionals being the institutional memory of departments. While paper files as institutional memory are different from professionals as institutional memory, it is the perspective of treatment of information and knowledge within a corporation that is interesting.

> "The fundamental goal of City Knowledge is to bring about a paradigmatic shift in the mindset of municipalities whereby they will begin to treat information as a primary infrastructure, parallel to other physical and/or administrative infrastructures such as transportation, water, sewers and education." (Carreira, 2007, P. 52)

One of the most well-known innovations that has accomplished this cataloguing of information, acts as one of many functions of GIS. This frame of mind of valuing the proper cataloguing of information to the degree that we value physical infrastructure is a fascinating viewpoint when considering the benefits of online development control and technological innovation in planning and can be useful when dealing with negative perceptions of technology from an organizational point of view.

2.3.2 The Adoption of Geographic Information Systems

Though computer-based GIS is known to have been used since the late 1960s, the documentation of this adoption of technology lacks a comprehensive formalized history. As with many innovations both before and since GIS, it is evident that there were several independent initiatives, unaware of each other and focused on separate nuances of the industry. (Coppock and Rhind, 1991)

> "Like the reality (as opposed to the reporting) of scientific research, there was no strictly logical progression towards the development and implementation of GIS, but rather a mixture of failures, set-backs, diversions and successes. Inevitably, more is known about the successes than the failures which… have been numerous and often attributable to bad advice, ignorance and a determination to go it alone. This is unfortunate because failures are often as illuminating as successes, if not more so." (Coppock and Rhind, 1991, p.23)

To better understand the evolution of GIS, it can be broken down into three time periods. (1) 1950-1970: Innovation (2) 1980s: Integration and (3) 1990-today: Proliferation. (Malczweski, 2004)

(1) 1950-1970: Innovation: One of the earliest endeavors into automation of mapping was a decidedly non-digital attempt by botanist Perring, using a modified punch card technique on pre-printed paper with grid references. While the analysis of this in large volumes was later understood to be best done by digital computer, it acted as a precursor to mapping by line printer in the 1960s. (Coppock and Rhind, 1991) It is important to note that as a botanist, Perring's need for mapping was user-driven. "His initiative also illustrates an aspect to be repeated in many later projects where the application of technology was driven by an urgent need of the users." (Coppock and Rhind, 1991, p. 26) This underscores the importance of individuals buying into the adoption of technology and

also an interface that is user-friendly and built to solve problems as experienced by the user of a process.

The Urban and Regional Information Systems Association, founded in 1963 was largely lead by University of Washington geographer Garrison and transportation engineer Horwood, after developing quantitative methods in their transportation studies, noted as the earliest evidence of GIS. (Coppock and Rhind, 1991) The developments in computer hardware during this time were paired with theoretical progression in spatial disciplines such as Garrison and Horwood's quantitative approach to analyzing spatial patterns, but also concepts such as map layers and topological structure. (Malczewski, 2004)

> "In 1963, the Development of Canada Geographic Information (CGIS) project was launched. The CGIS system was designed for land inventory and for generating and analyzing information to be used in developing land management plans. The project has pioneered many aspects of GIS by providing a number of conceptual and technical innovations…such as the…separation of data into attribute and locational files and organizing geographical data themes or layers, the implementation of functions for polygon overlay, and measurement of area." (Malczewski, 2004, p.10)

At roughly the same time in 1965, the US Bureau of the Census identified a huge need in automated data processing to address the mail-out/mail-in fundamental process of the US census in concert with the requirement to produce area-based summaries founded

on records with only a postal address for reference. The importance of understanding the benefits of digitally processing spatially based information cannot be overlooked, and forms the basis of why and how GIS exists today. By the end of the 1960s, computer-assisted mapping that mimicked manual methods of map production had become widespread. (Coppock and Rhind, 1991)

(2) 1980s: Integration: The continuous reduction in the cost of processing power during the 1980s allowed for advances in how computers functioned. The transition from command-line systems requiring the user to understand basic computer language to software with graphical user interfaces (GUI) caused a significant transformation within the GIS industry. With this shift came Environmental Systems Research Institute, better known today as ESRI. ESRI released ARC/INFO in the early 1980s. "ARC/INFO was an application-oriented vector-based system with a 'toolbox', command-driven, product-oriented user interface modular design allowing complex applications to be developed on top of the toolbox." (Malczewski, 2004, p.11)

The sinking price of computer hardware during this time, paired with the development of other innovations including computer assisted drafting (CAD) and global positioning systems (GPS) made GIS a feasible technology for both academic and municipal planning departments. There was a steadily increasing acceptance of GIS during this time, in part due to ESRI's ability to instill confidence through their staff's heavy involvement in their consulting projects, allowing flaws in their software to be identified internally at an early stage. (Malczewski, 2004; Coppock and Rhind, 1991)

(3) 1990-Today: Proliferation: While GIS began as software with a high barrier to use, from the 1990s on, it's outputs are more easily understood by those without professional backgrounds. "Better awareness of the value of digital spatial data and GIS-based solutions to planning, decision making and management problems have produced a large market for GIS." (Malczewski, 2004, p.12) GIS has grown as data and access to information from both private and public industries has become more readily available. The Open GIS Consortium (OGC) Project was established in 1994 and has been a key player in advancing the concept of open GIS, allowing it to intermingle with different applications more seamlessly, including non-spatial databases or graphics programs. This opens doors to integrating GIS with analysis models but also with decision making processes. (Malczewski, 2004) This cohesive approach to GIS is the foundation for the future of innovation in digital spatial analysis.

2.3.3 Perspectives on Technology Adoption in Planning

One of the anticipated barriers to the adoption of online development control is the perception of technology from municipal planners. The fact that there is already a process in place means that there must be perceived benefit in order to change. As discussed previously, with Rogers' theory of adoption and the early innovation of GIS, having user and individual buy in is important to the greater adoption process as a whole. Research surrounding technology perception in the planning industry produced well repeated issues concerning resource availability in terms of financial, training and time constraints. Slotterback (2011) outlines the benefits of technology implementation such as efficiency and user friendliness and the ability to decipher public input based on location of

participants to paint a more accurate picture of public thought and community support. The paper, *Planners' perspectives on using technology in participatory processes*, champions the benefit of being able to gather and physically interact with information such as integrating public opinions directly into planning land use models.

Research within her study depends on the expertise of practicing planners to decipher whether or not technological advancements in public participation are welcome or would be useful in consultation processes. A representative sample of 83 full survey respondents of planners in Minnesota who cite experience dealing with the public, was the main resources for understanding the potential for technology in this context. The availability of current technology types were examined in addition to the level of uncertainty about staff capacity, technology access, and perspectives on using technology in the participatory process.

While there were some concerns, professional planners reacted in a generally positive way concerning the potential use of technology to help facilitate public participation. They noted, however, that it should be used mostly to enhance rather than replace traditional methods. (Slotterback, 2011) This may be a common reaction in terms of online development control applications as well. Respondents were also asked to speculate on the response of potential users of the technology. (Slotterback, 2011) While this can provide insight into what planners believe the public is looking for, in the context of online development control, it may prove more helpful to pair this with asking private sector development industry professionals directly.

Using GIS implementation as a benchmark for online development control applications offers a more complete picture of implementation and technology adoption procedures in planning. Göçmen and Ventura (2010) examine the use of GIS in public planning agencies and the barriers to its full potential use. While resources such as time, training and financials are cited, the pace of technology change was also noted as a significant barrier. Similarly to Royse's theory of thick and thin clients, agencies were divided into those who used GIS for basic and for advanced functions. Not surprisingly, those agencies that used advanced functions cited an enthusiasm for GIS within their workplace and were more than twice as likely to have completed formal GIS training. Intuitive solutions that require little training and do not require extensive retraining with updated software seem to be lacking.

This is important to note with the development of software for advanced GIS/PSS functions – including those of public participation, modelling and suitability analysis. Online development control should require little retraining and updating, however it is significant to consider that even the perception of this can be a potential barrier to its adoption.

When it comes to GIS and PSS based innovations, their multipurpose nature, drawing from both centralized and decentralized processes, should be understood as slightly unconventional in terms of their practical diffusion to potential users. (Onsrud and Pinto, 1993) "Geographic Information Systems are multipurpose tools offering advantages to different classes of users which diffuse them at different rates. (e.g., utilities versus planning agencies versus scientists versus delivery services.)" (Onsrud and Pinto, 1993,

p.19) Perhaps most importantly for the purpose of this study, it reiterates the significance of capturing individuals' views to understand the usefulness of the technology to different classes of users such as municipal planners or consulting planners. Onsrud et al. go on to explain that for each of these classes, extensive adjustment to operational processes appears necessary before the resulting potential of the product is perceived to be beneficial. (Onsrud and Pinto, 1993) This may signal the need for further research into organizational adoption at the municipal level.

Perspectives on technology in planning have changed extensively since the 1970s. In his transportation planning book, Urban Transportation Planning, Creighton (1970) frankly and eloquently attacks the normative approach of the times.

> "During the past two decades – at first somewhat slowly, and now more swiftly – there have been assembled a body of data and a set of procedures by which teams of persons with different skills have been able to prepare long range plans … These plans have not been simply designs based on intuition and judgment, but are based on rigorous processes, including computer tests, which demonstrate that the recommended plan maximizes performance in relation to an accepted goal. … A substantial gap exists between the thinking of those with experience in this field and those who should know: political leaders, executives … this knowledge gap is hurtful … simplistic solutions are proposed

> with sublime assurance … [largely] without any consideration of goals, [and] mostly without data." (Creighton, 1970, xvi)

This view of those without expertise not having a fulsome understanding of the issues and complexities that they are addressing has to some degree been tackled by the uptake, simplification and outputs of GIS, turning complex patterns and data into visually understandable materials. "We need to be aware of the limitations of our habitual thought process when dealing with complex subjects such as transportation and cities." (Creighton, 1970, xvii) This is true also of development planning and the processes by which it is done. The process is still shrouded in technical jargon and expertise with little visualization or simplification. "The contrast between these two perspectives of planning goes along the line between the 'close' and 'open' use of computer technology. It is marked by the difference between planning methodology that is understandable only to experts, and the community-based, participatory style of planning." (Malczewski, 2004, p.13)

Perspectives surrounding technology in planning have transformed as approaches to planning have evolved. The 1960s methodology of planning through applied science was paired with data oriented information systems. This morphed into a process oriented policy approach that coincided with information management technology tactics in the 1970s and communication heavy planning theory that worked hand in hand with knowledge based decision support systems through the 1980s. (Malczewski, 2004)

Whereas perspectives of technology in planning have come a long way since the 1970s and even earlier, renewed thinking about processes such as development control are long overdue for a refresh with an open, participatory approach to the technical aspects on

which they are based. Municipal planners may be open to this shift, and it is important, as user, that they are. However, there needs to be a perceived benefit, few barriers such as complicated or expensive training and retraining, and a participatory approach that allows those who are not technical experts or who are outside of the process, to be informed in an effort to narrow the existing knowledge gap.

2.4 In Summary

In summary, the literature review for this study provides an understanding of the theories of technology adoption including diffusion theory, early adopters, perspectives on adoption and the pillars of technology adoption. Software innovation in the field of planning was explored, including the history of GIS, the origins of PSS and what types of technology are being developed in the planning industry. It provides an overview of the perception of technology use in planning and the integral role that technological adoption processes have on the success or failure of software.

Key takeaways to keep in mind include the focus on providing information that is accessible, relevant and easy to use. Accessibility of information can be achieved through innovative ways of visualizing and communicating complicated data to the public and other professionals. In general, municipal planners have responded positively to the potential use of technology, however more so as an enhancement rather than replacement of current processes. Resources such as time, training and financial constraints were cited as barriers along with the pace of change. Adjustments to operational processes are often necessary and may differ across municipality, as the size, structure and goals may change, but

individual acceptance at the user level is equally important. In short, the adoption of technology in planning processes is often the largest barrier.

CHAPTER 3 - METHODOLOGY

This is a quantitative study with the goal of assessing the potential for the adoption of technological innovation in the development control process in Ontario, Canada. The first stage of this study involves a review and understanding of theories associated with the adoption of technology, with findings from the literature review working to shape survey questions to understand broad trends and views associated with innovation in development control and assess potential for adoption while understanding opportunities and barriers as identified by industry professionals.

This research study looks to address three key research questions:

- What are the opportunities for innovation within development control?
- What are the barriers to innovation within development control?
- What is the role of technology in addressing these opportunities and barriers?

As mentioned in the literature review, research into innovation within the development control process has been limited, and therefore the research strategy for this study is based on learnings from previous studies on technology adoption theory and leveraging methods used in an academic study on gauging municipal planner support for innovative ways of conducting public participation, mainly through an online survey. (Rogers, 1995; Slotterback, 2011) This chapter outlines the rationale for this methodological approach, the details of its design, and finally its strengths and weaknesses.

3.1 Research Strategy and Design

When setting out to design a research strategy, qualitative, quantitative and mixed methods approaches were considered. While each has their own merits and drawbacks, a quantitative study was chosen in order to gain a broader interpretation of the willingness to adopt technology within the development control process. This strategy of a more neutral analysis was chosen to allow for a more fulsome analysis across municipal boundaries and across individual or organizational preference, in an effort to reduce bias inherent in qualitative studies, and to serve as a stepping stone for further research.

As well, findings from the literature review provided necessary assumptions on which to compare results, such as Rogers' suppositions regarding adopter profile segment sizes and associated characteristics. A quantitative study allowed for comparison of these assumptions at an appropriate level.

Research design focused on revealing opportunities and barriers to adoption at the individual level for three reasons. (1) To achieve an understanding of opportunities and barriers as expressed by the user, consistently identified throughout the literature review as having an overall effect on adoption. (Coppock and Rhind, 1991; Royse, 2008; Horrigan, 2010) (2) To achieve a sample comparable to assumptions made in Rogers' theories of individual innovativeness and technology adoption. (Rogers, 1995) (3) To provide a foundation for research on the topic of innovation in the development control process on which to build qualitatively outside this study that can provide increased context and nuance to findings garnered through a quantitative analysis.

The survey (Appendix II, p.82) was also designed to be relatively short to maximize responses, and flow logically from questions regarding the current process to questions about potential improvements to technology adoption questions and finally demographic information. This flow of questions was chosen intentionally to take the participant on a journey and also to allow for comparison of results between impression of the current process and interest in innovation to account for any discrepancy.

3.2 Study Location

This study focuses on municipalities across Ontario, Canada. The survey is targeted at a wide variety of participants who live and work in diverse municipalities in terms of size and location across Ontario. Casting a wide net geographically helps to work towards achieving a well-rounded response rate from those who work not only inside, but outside to process as consultants, developers and builders' work may not be confined by municipal boundaries.

3.3 Data Collection Methods

Data collection methods centre on a survey of professionals in the planning and development industry, who work in Ontario, regarding their views on the potential for the adoption of online development control. The survey is designed to answer the research questions posed at the beginning of this proposal, and mirror the methodology used by Slotterback to gauge interest in innovation in a parallel planning process, public participation. (Slotterback, 2011) Surveys were chosen for this study due to their relatively inexpensive cost, ease of use and associated high response rate, as well as the ability to be

analyzed quantitatively in order to gain a statistical impression of how online development control is perceived by the user.

In order to reach respondents, a link and short description of the research was included in the March 2014 Ontario Professional Planning Institute monthly e-newsletter, which is distributed to the over 3,000 members of OPPI. (Appendix I, p. 78) Additionally, leveraging of social media and networks was used through Twitter, Facebook and LinkedIn to disseminate the survey through multiple streams and to generate continued interest through the entire open survey period.

3.4 Sampling

Sampling techniques used for the purpose of this study include employing stratified random sampling, a subset of probability sampling. Advantages to this type of sampling include the avoidance of the simple random sampling error, such as receiving feedback from only respondents who have little or no familiarity with the development control process. By targeting professionals in the planning and development industry directly, the participants are still random, however drawn from an appropriate population. The survey sampling technique was used in order to target as professionals in the industry as possible in order to gain a response rate that can be quantitatively analysed. Using the OPPI e-newsletter to distribute the survey link worked to achieve this.

Snowball sampling, a type of non-probability sampling, was also used through outreach of social media and networks in order to best locate planning professionals directly involved with development who may also pass the survey along to others in their field. Disadvantages of this type of sampling include the non-random survey sample.

However, pairing snowball sampling with stratified random sampling, dilutes this disadvantage and bolsters the outreach for respondents.

3.5 Limitations

Limitations in this study centre on response rates. There are a wide variety of professions that interact with the development control process, and putting surveys in the hands of those involved in all aspects at an equal rate may prove challenging. The survey is also self-selecting, and is open to a self-selection bias.

The complexity of the study is also a limitation. There is a lot to ask and certain respondents may be able to answer some things more accurately than others, posing difficulties especially when it comes to surveys. Questions revolving around the perceived benefit of an online development control process may be best understood by consulting or municipal planners in the development department; however it should be noted that questions about technology adoption procedures may have absolutely nothing to do with their department and could be controlled by the Executive, Directors or other decision makers for the municipality or firm. This is accepted as a limitation of this research as the focus lies in the adoption of an innovative development control process from the user perspective. Further research on organizational adoption is required for a more fulsome understanding. Given these limitations, an aspect of caution in the confidence of the results may be warranted. As previously discussed, this research aims to provide a foundation on which to enrich the discussion of the potential for innovation in the development control process. Challenges with response rates, the self-selection and non-random bias should be taken into consideration along with understanding the

organizational structure of which decisions on technology adoption are made. User adoption, in this case, may not translate directly to widespread organizational adoption, however, provides the groundwork for which to investigate that aspect.

CHAPTER 4 – RESULTS AND DISCUSSION

4.1 Introduction

This research focuses on understanding the potential for adoption of technology and the implications for innovation in planning. The lack of discussion on this topic has led this study to consider the adoption of GIS and PSS as well as technology adoption theory in general in order to gain a broader understanding of the issues and influence fundamental research and survey questions.

This thesis pursues to build on the broader discussion of technology in planning, specifically by looking at innovation in the development control process in Ontario, Canada. The survey was designed to answer three key research questions:

- What are the opportunities for innovation within development control?
- What are the barriers to innovation within development control?
- What is the role of technology in addressing these opportunities and barriers?

Based on these, 10 questions were developed and included in an online survey, fully completed by 64 participants from various communities across Ontario, Canada.

4.2 Survey Respondent Breakdown

The online survey was distributed by the Ontario Professional Planning Institute to its 3000 members through their monthly newsletter. 111 respondents clicked the link, 64

participants fully completed the survey and 47 either did not fully complete the survey or were not professionals in the planning or development industry who lived or worked in Ontario.

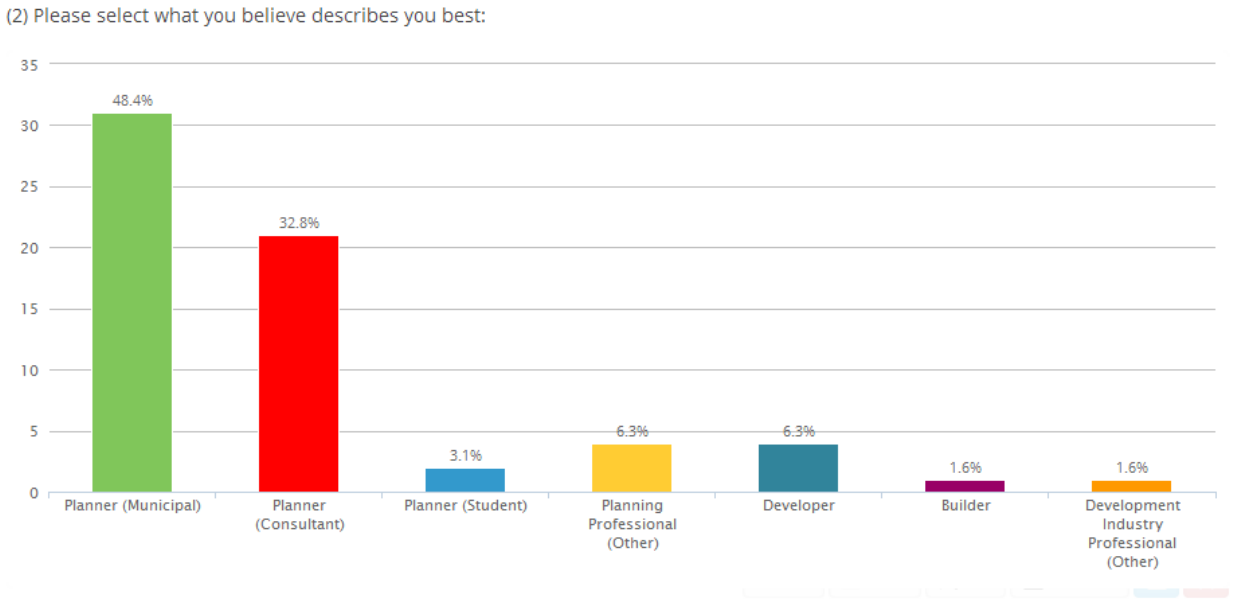

Figure 4 - Survey Respondent Breakdown

Of those 64, 31 indicated they were municipal planners, 21 were consultants, 2 were planning students, 4 indicated they were a planning professional other than a municipal or consulting planner, 4 were developers, 1 was a builder and 1 indicated they were a development industry professional in another capacity. (Figure 4, p.43)

A limitation of this study, as previously mentioned, centres on response rates, especially gaining an equal rate of response from all aspects of the planning and development industry, as it is widely varied. Response rates for professional categories other than municipal planners and consultant planners were unfortunately low. This

presents an issue in gaining a clear picture of how developers, for example, feel about an online development control process. There are not enough responses to adequately or ethically state that the responses reflect opinions of that professional group. However, their responses are valid, adding nuance and variety while reducing bias when taken into context of overall results. Though combining all responses other than municipal or consulting planners into a single "other" category was considered, the rationale of analyzing this "other" category when its members are so varied and unalike, for example planning students and professional builders, breaks down. It is not statistically relevant to draw conclusions from a mixed bag of professionals with vastly different experiences and interpret them as one voice. Therefore, this study has chosen to analyse these results in an overall picture of opinion, and to use the high response rate categories of municipal and consulting planners as a measure of differences in opinions between those inside and outside the current development control process.

Surveys were completed by individuals who lived and worked in 22 distinct communities across Ontario, with the most respondents indicating their main municipality of employment was in Toronto (8), Markham (6), Ottawa (4) and Hamilton (4).

The majority of respondents fell into the 25-34 year age group at 50%, while the second highest response rate came from those 45-54 years of age with 16%. Two-thirds of respondents identified as male, and the majority of respondents possessed a Bachelor's Degree (64%) or Master's Degree (33%). Finally, a total of 88% of respondents indicated that they were either familiar or very familiar with the development control process.

4.3 Opportunities for Innovation within the Development Control Process

The first research question posed by this study centres on the opportunities that may exist for innovation within the development control process. In an effort to tease out the potential for opportunities, survey participants were asked to respond to 2 matrix style questions. The first asked participants to describe their satisfaction with a variety of aspects of the development control process. This aimed to expose possible openings for improvement without directly asking where improvement could be made. The second question asked the opinion of participants on the level of impact facets of the process have on the time it takes for development applications to be approved. This exposes areas where there may be opportunity for innovation and is a more direct ask of where improvement could be made to reduce time consuming hurdles.

4.3.1 Satisfaction with the Current Development Control Process

Overall

Overall, participants tended to respond that they were somewhat satisfied with most aspects of the current process. (Table 5, p.46) The aspect with the greatest satisfaction was 'personal interaction with Planners or City Staff' with 38.1% indicating they were very satisfied. While respondents were generally satisfied with the feedback received on their applications, the largest percentage of responses, at 25%, landed in the somewhat dissatisfied category.

This reinforces the importance of adopter based instrumentalist theory that accounts for under-represented hurdles in adoption, such as complacency, and rejects the pro-innovation bias inherent to developer based deterministic views. (Lieven del Marez, 2011; Surry, 1997; Slater & Mohr, 2006) Keeping this in mind, it is very important to note that the aspect that received the greatest response in the very dissatisfied category (14.1%) was the 'use of paper forms / hard copy forms to submit application', a cornerstone for the adoption of online development control.

(3) Based on your experience with the development control process, please describe your satisfaction with the following:

Variable	Very Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Very Satisfied	Don't Know	
Your local municipality's website	5 7.8%	18 28.1%	9 14.1%	28 43.8%	3 4.7%	1 1.6%	Total: 64
The ability to find correct information (cost, deadlines, zoning, information, etc.)	6 9.4%	19 29.7%	8 12.5%	23 35.9%	7 10.9%	1 1.6%	Total: 64
The ability to find the correct forms (severance, minor variance, demolition permit, etc.)	3 4.8%	9 14.3%	7 11.1%	27 42.9%	16 25.4%	1 1.6%	Total: 63
Ease of filling out the application	3 4.7%	8 12.5%	13 20.3%	27 42.2%	10 15.6%	3 4.7%	Total: 64
Availability of assistance	3 4.8%	14 22.2%	12 19.0%	11 17.5%	18 28.6%	5 7.9%	Total: 63
Use of paper / hard copy forms to submit application	9 14.1%	8 12.5%	12 18.8%	18 28.1%	12 18.8%	5 7.8%	Total: 64
Method of payment	3 4.7%	5 7.8%	13 20.3%	19 29.7%	18 28.1%	6 9.4%	Total: 64
Hours of operation to submit application (Business hours: 8:30am-4:30pm)	1 1.6%	9 14.1%	13 20.3%	16 25.0%	23 35.9%	2 3.1%	Total: 64
Feedback received (approval, denial, reasons why)	4 6.3%	16 25.0%	10 15.6%	15 23.4%	12 18.8%	7 10.9%	Total: 64
Appeal process (committee of adjustment)	2 3.1%	9 14.1%	15 23.4%	20 31.3%	11 17.2%	7 10.9%	Total: 64
Personal interaction with Planners or City staff	0 0.0%	10 15.9%	12 19.0%	15 23.8%	24 38.1%	2 3.2%	Total: 63
The development control process (in general)	5 7.8%	15 23.4%	14 21.9%	20 31.3%	9 14.1%	1 1.6%	Total: 64

Table 5 – Satisfaction with the Current Development Control Process

Municipal Planners

Municipal planners were much more likely to indicate their satisfaction across a number of aspects, including using the municipal website to find correct information when it comes to costs, deadlines and zoning information. In response to the ability to find the correct forms, such as those for severance, minor variance or demolition permits, 74.2% of municipal planners were somewhat to very satisfied.

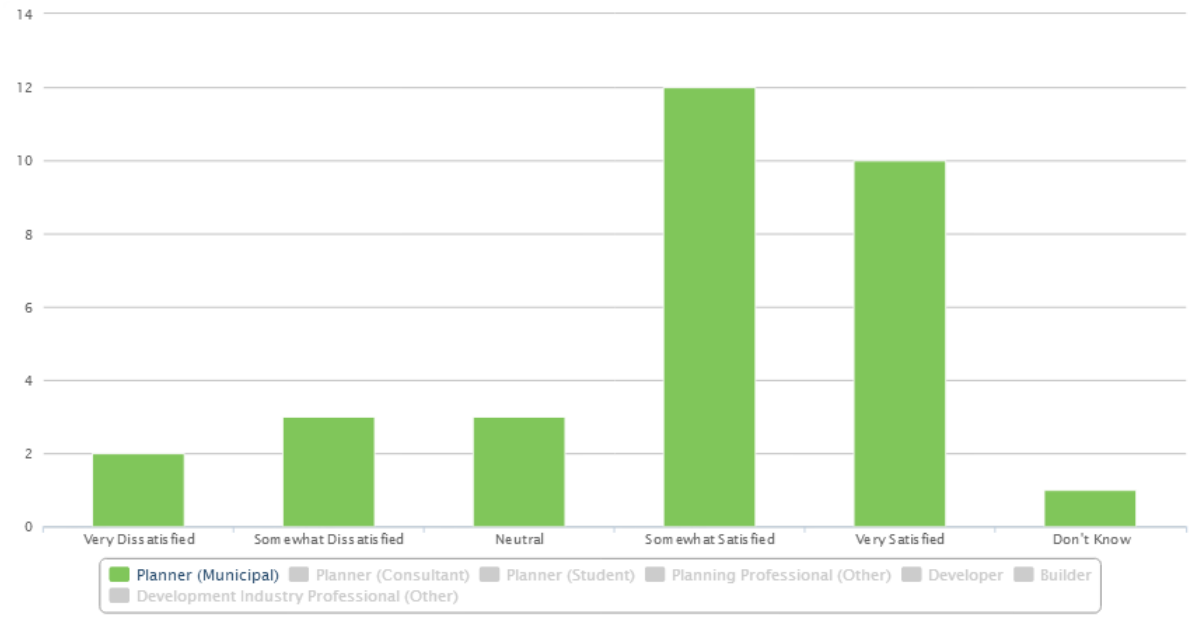

Figure 5 - Municipal Planner Level of Satisfaction with Use of Paper / Hard Copy Forms

Unsurprisingly, 58% of municipal planners responded that they were very satisfied with the availability of assistance as well as the hours of operation available to submit forms (business hours, generally 8:30am-4:30pm). This could be attributed to a lack of desire to extend working hours.

The aspect that municipal planners indicated the most dissatisfaction with was their municipal website, although they were still heavily outweighed by those municipal planners who were satisfied with theirs. Unexpectedly, 71% of municipal planners indicated they were either somewhat or very satisfied by the use of paper or hard copy forms. (Figure 5, p.47)

Consultant Planners

Respondents that identified as planners working as consultants often indicated opposing levels of satisfaction compared to municipal planners when it came to current aspects of the development control process. For example, 56% of consultant planners indicated they were somewhat dissatisfied with their local municipal website.

The aspect of the current process with the most polarizing response from municipal and consulting planners centred on the satisfaction with feedback received on applications for approval or denial. 58% of planning consultants were somewhat or very dissatisfied, whereas 71% of municipal planners were somewhat to very satisfied with the feedback they provided. Coppock and Rhind (1991) explore this user-driven tendency toward innovation in their discussion of the adoption of GIS, citing the example of botanist Perring's early attempt to improve mapping. Dissatisfaction on the user end, such as the consulting planner, has been historically repeated as an urgent driving factor in the application of technology. (Coppock & Rhind, 1991)

4.3.2 Impacts on Timing of Approvals

Overall

A majority, 61.9% of respondents indicated that the number of changes or further work required had a strong influence on the time it takes for development applications to be approved. (Table 6, p.49) Furthermore, 59.4% of respondents indicated that the circulation time between necessary internal departments, and 57.8% indicated the speed of those responses, had a strong impact. The consideration with the greatest number of "low impact" responses was the scheduling or attending of meetings, with 31.2% indicating it did not have a strong influence on the timing of approvals. Interestingly, 50% of respondents cited conflicting comments from different departments or agencies as having a strong impact on timing.

Table 6 - Impacts on Timing of Approvals

(4) Based on your experience, what level of impact do the following considerations have on the time it takes for development application approvals?

Variable	None	Low	Moderate	Strong	Don't Know	
Municipality considering the application to be complete	0 0.0%	17 26.6%	20 31.3%	25 39.1%	2 3.1%	Total: 64
Circulation time between necessary internal departments	0 0.0%	5 7.8%	19 29.7%	38 59.4%	2 3.1%	Total: 64
Conflicting comments from different departments or agencies	1 1.6%	11 17.2%	17 26.6%	32 50.0%	3 4.7%	Total: 64
Scheduling or attending meetings	1 1.6%	20 31.3%	25 39.1%	14 21.9%	4 6.3%	Total: 64
Scheduling or attending public consultation when essential	1 1.6%	18 28.1%	28 43.8%	13 20.3%	4 6.3%	Total: 64
Number of changes or further work needed	0 0.0%	2 3.2%	20 31.7%	39 61.9%	2 3.2%	Total: 63
Speed of response from applicant	2 3.1%	13 20.3%	17 26.6%	28 43.8%	4 6.3%	Total: 64
Speed of response from internal or municipal staff	0 0.0%	6 9.4%	19 29.7%	37 57.8%	2 3.1%	Total: 64
Fulfilling conditions of approval	0 0.0%	10 15.6%	19 29.7%	33 51.6%	2 3.1%	Total: 64

Municipal Planners

An overwhelming 90% of municipal planners indicated a moderate to strong impact (42% and 48% respectively) of circulation time to departments and agencies on the timing of approvals, while 81% of municipal planners also indicated that conflicting comments had a moderate to strong impact on timing (39% and 42% respectively). An additional 68% indicated that the speed of responses had a strong impact as well.

This points to inefficiencies in the current process and a breakdown of communication, understanding of roles and hierarchy of responsibilities and signals clear opportunities improvements. However, 61% of municipal planners also shifted impacts elsewhere, noting that fulfillment of conditions on the applicant side also had a strong impact in the timing of approvals. Alternately, scheduling of meetings had the greatest percentage of low impact responses, with 39% indicating it had little effect.

Consultant Planners

A total of 95% of planners who identified as consultants indicated that circulation time between departments and agencies had a moderate to strong impact on the timing of approvals (24% and 71% respectively). While a lower percentage overall of consulting planners (71%) felt conflicting comments had a moderate to strong impact on timing compared to municipal planners, they were more likely as a group (57%) to indicate the impact was strong (42% municipal planners). (Figure 6, p.51)

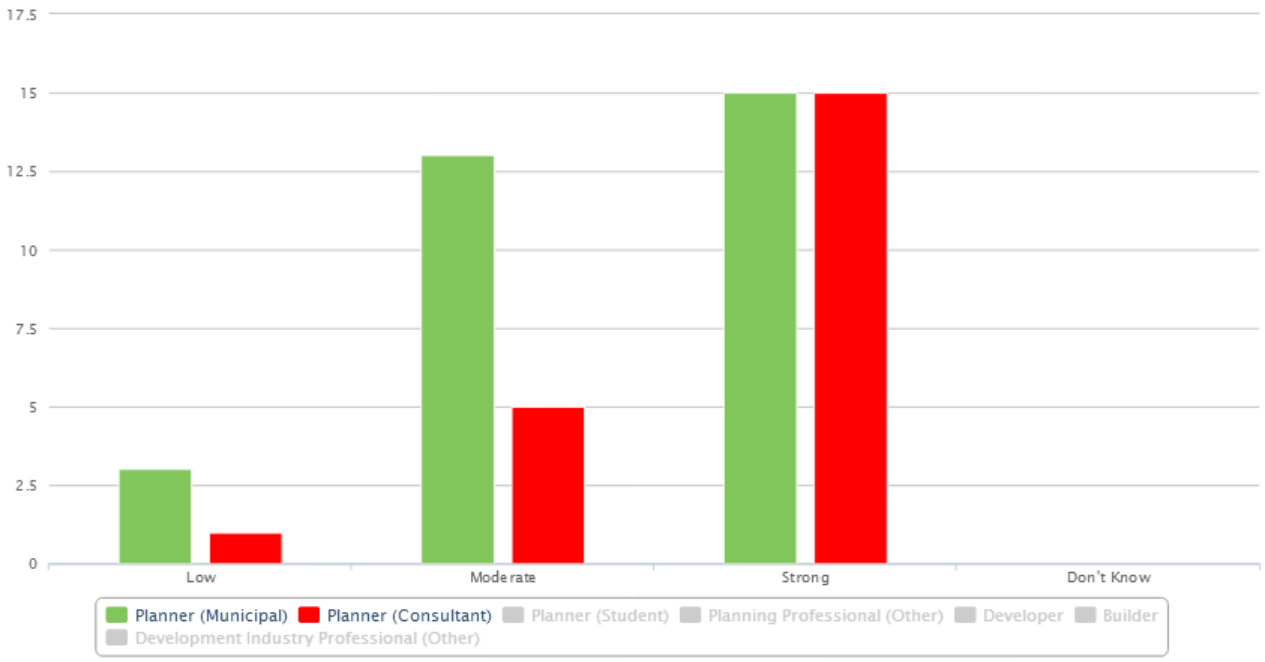

Figure 6 - Impact of Circulation Time between Necessary Internal Departments

Similarly, 76% of consulting planners indicated the speed of response had a strong impact on the timing of the approvals of their application. This relative level of agreement between municipal and consulting planners strengthens the correlation of improving the process with refining wait times for approval of development applications. Scheduling of meetings had the greatest percentage of low impact responses, with 33% indicating it had little effect.

4.3.3 Conclusion

Results related to satisfaction with various aspects of the current process yielded a polarizing experience. 48% of municipal planners were "somewhat satisfied" with the development control process in general while 29% of municipal planners were "very satisfied" with the development control process in general. Notably, they were the only group to have answers in the very satisfied category. All other professional groups involved

in development control responded as somewhere between very dissatisfied and neutral towards the current process – accounting for 53% of total responses.

It is not entirely surprising that municipal planners answered favourably towards the process they administer, and realities of opportunities for improvement were better garnered through asking the level of impact certain aspects had on the timing of approving a development application. Municipal planners tended to answer more in line with other professionals' experiences when asked how aspects of the process that they seemed previously very satisfied with affected the timing of approval of applications. The greatest opportunities lie in streamlining the coordination and speed of comments from internal departments and affected agencies.

4.4 Barriers to Innovation in the Development Control Process

In an effort to address the research question "what are the barriers to innovation in development control", survey participants were asked two very different questions. Survey question 5 asked them to rate their level of interest in various new or innovative ways to carry out aspects of the development control process. The intent was to see whether an interest in innovating existed at the individual level, or whether a significant barrier to adoption at a greater organizational level was planning and development professionals having no real interest in innovation within the development control process at all. It was important to determine the individual appetite for innovation to serve as a foundation for understanding the potential for adoption over a greater population, as discussed by Rogers' theory of innovations. (Rogers, 1995) This question also aimed to gauge whether innovation of certain aspects were more or less desirable, leveraging learnings from Royse

(2008) on the key to advancing the accessibility of information through innovation, and whether answers aligned with previous responses regarding current levels of satisfaction.

Survey question 6 more directly asked participants their opinion, based on their experiences, what level of impact various considerations such as cost have on adopting a new online process for development control. This, paired with levels of interest in innovation, works to identify specific barriers in implementing innovation in development control.

4.4.1 Interest in Innovation of the Development Control Process

Overall

Overall, 80% of respondents indicated they were "somewhat (25%) to very (55%) interested" in the ability to submit their development application online. (Table 7, p.53) Only 3% of respondents indicated they would not be interested in online submissions.

Table 7 - Interest in Innovation of the Development Control Process

(5) How interested would you be in the following?

Variable	Not Interested	Low Interest	Neutral	Some Interest	Very Interested	Don't Know	
The ability to submit your development application online	2 3.1%	3 4.7%	6 9.4%	16 25.0%	35 54.7%	2 3.1%	Total: 64
The ability to pay for your development application online	0 0.0%	2 3.2%	9 14.3%	9 14.3%	38 60.3%	5 7.9%	Total: 63
The ability to receive assistance with your application in real time over the phone or online outside of business hours	4 6.3%	8 12.5%	11 17.2%	20 31.3%	19 29.7%	2 3.1%	Total: 64
The ability to receive feedback from the municipality about your application online	0 0.0%	3 4.7%	8 12.5%	25 39.1%	26 40.6%	2 3.1%	Total: 64
The ability to adjust your application without reapplying	0 0.0%	4 6.3%	8 12.7%	8 12.7%	38 60.3%	5 7.9%	Total: 63

This directly opposes overall responses for satisfaction with current use of paper or hard copy submissions with 47% having responded they were somewhat (28%) to very (19%) satisfied. These responses cue that a potential barrier to innovation could be complacency with current system. 60% of respondents indicated they were very interested in being able to pay for applications online and the same percentage indicated they were very interested in the ability to adjust their applications without having to reapply.

Municipal Planners

Surprisingly, given their satisfaction with paper forms, 55% of municipal planners indicated they would be very interested in the ability to submit development applications online, with a further 23% indicating some interest. 6% indicated they were not interested,

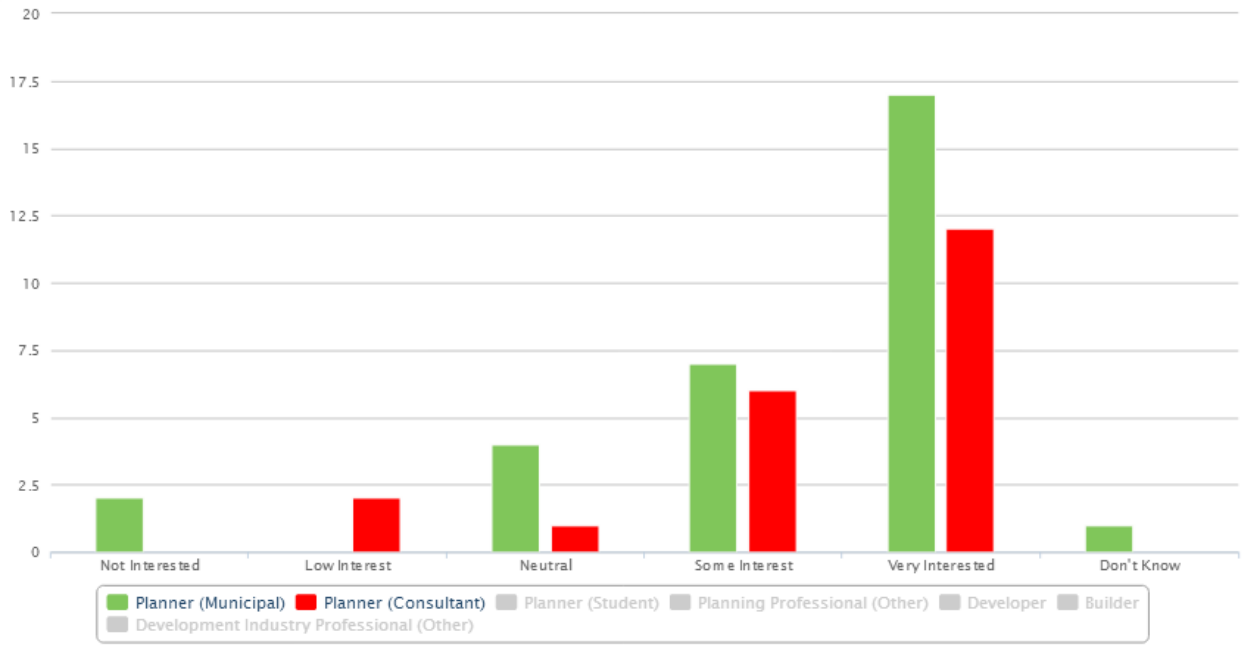

Figure 7 - Level of Interest in the Ability to Submit Development Applications Online

and were the only professional group to have answers in the not interested category. Carreira (2007) touches on the negative perceptions of technology and the costs of institutional memory. This interest in the digitization of applications may be founded in the "pragmatic shift in the mindset of municipalities…to treat information as infrastructure." (Carreira, 2007, p.52)

61% of municipal planners responded that they would be very interested in the ability to pay for development applications online. (Figure 7, p.54) However, the ability to receive assistance on applications online or on the phone outside of business hours received the least amount of very interested responses, with 26%, although a further 39% indicated some interest.

Consultant Planners

86% of consulting planners indicated they were very (57%) to somewhat (29%) interested in the ability to submit development applications online, while 55% indicated they would be very interested in the ability to pay online. Not surprisingly, 81% of consulting planners indicated that they would be very interested in the ability to adjust their application without reapplying, as this would allow for major financial and resource savings.

4.4.2 Considerations when Adopting Technology

Overall

The consideration with the greatest percentage of responses indicating a strong impact on the ability to implement a new online process was the integration with existing

processes at 59%. (Table 8, p.56) Closely behind that, 58% of respondents indicated that the initial capital cost had a strong impact. External stakeholder concerns generated the most low impact responses with 17%, however 45% of respondents still felt that it would have a moderate impact.

Table 8 – Considerations when Adopting Technology

(6) Based on your experience, what level of impact do the following considerations have on adopting a new online process?

Variable	None	Low	Moderate	Strong	Don't Know	
Initial capital software cost	2 3.1%	5 7.8%	14 21.9%	37 57.8%	6 9.4%	Total: 64
Ongoing maintenance costs	2 3.2%	7 11.1%	23 36.5%	25 39.7%	6 9.5%	Total: 63
Training time / cost	1 1.6%	7 10.9%	22 34.4%	28 43.8%	6 9.4%	Total: 64
External stakeholder concerns	0 0.0%	11 17.2%	29 45.3%	17 26.6%	7 10.9%	Total: 64
Internal stakeholder concerns	0 0.0%	7 10.9%	27 42.2%	24 37.5%	6 9.4%	Total: 64
Legal issues	0 0.0%	7 10.9%	19 29.7%	27 42.2%	11 17.2%	Total: 64
Process complexity	0 0.0%	6 9.7%	25 40.3%	29 46.8%	2 3.2%	Total: 62
Integration with existing processes	0 0.0%	7 11.1%	16 25.4%	37 58.7%	3 4.8%	Total: 63

Municipal Planners

74% of municipal planners indicated that the initial capital software cost would have a strong impact on the adoption of a new online process, with 58% believing that ongoing maintenance costs would continue to have a strong impact. This was expected result as research into perspectives on technology adoption in planning repeatedly yielded issues revolving around financial, training and time resources. (Slotterback, 2010; Gocmen & Ventura, 2010) External and internal stakeholder concerns generated the lowest levels of impact, with 71% and 68% respectively receiving low to moderate impact ratings.

Consultant Planners

Initial capital software cost would have a strong impact on adopting a new online process according to 57% of consultant planners, however 10% indicated it would have no impact at all. Only 25% responded that ongoing maintenance costs would have strong impacts. However, 60% indicated that the integration with existing processes would have a strong impact.

4.4.3 Conclusion

Municipal planners were overall surprisingly interested in various aspects of an online development control process, most notably the foundational ability to submit applications online and receive online payments. This flew in the face of previous responses by municipal planners of indicating high levels of satisfaction with the existing process. They were, however, on average more likely to feel that various considerations would have strong impacts to implementation.

Much like municipal planners, those who identified as consultants were very interested in online development control, especially the ability to adjust applications without resubmitting. This is not surprising, as it reduces wasted time and money on the behalf of the applicant. While not a significant sample size, 100% of developers indicated that they were also "very interested" in this aspect.

This affirms that municipal planners' satisfaction with the existing process is not a barrier in implementing a new process, as they have indicated their high level of interest in aspects of online development control. Barriers in implementation were quite different,

however. When it came to the impact various considerations have on adopting a new online process, municipal planners were much more conservative and likely to indicate strong impacts, except when it came to internal stakeholder concerns. Only 26% of municipal planners believed internal concerns would be strong, and 23% even believed they would have a low impact.

However, 48% of consulting planners indicated internal stakeholder concerns would have a strong impact and 38% indicated a moderate impact, with no consulting planners believing that internal concerns would have a low impact. This may speak to an awareness of planning consultants that municipal planners are more likely to have concerns with other various considerations of implementing an online process.

With respect to understanding barriers to implementing online development control, even though initial software cost and ongoing maintenance costs were identified strongly by municipal planners, planning consultants were less likely to identify this as a strong concern, opening up possibilities for shifting costs to the user end of the process to overcome this barrier. Barriers from the consulting side are more focused on attaining buy in from municipal planners and integrating with the existing, complex process. This validates Royse's key takeaway to advancing the accessibility of information, namely the importance of providing innovative ways of visualizing and delivering complicated and complex information and processes. (Royse, 2008) Furthermore, this underscores the importance of relationship building on the municipal side to ensure seamless integration with the existing process in order to overcome this perceived barrier.

4.5 The Role of Technology in Addressing Opportunities and Barriers

Once the opportunities and barriers to innovation with the development control process were understood, the role of technology in addressing them crucial to implementing an online process. Aspects of technology's role were included within questions previously discussed in this chapter centering around opportunities and barriers, with more direct questions regarding views on technology following. Participants were asked in Question 7 to rate the importance of qualities when adopting a new technology, developed from the perceived attributes noted in Rogers' Innovation Decision Process and the 5 stages of diffusion (Surry, 1997; Rogers, 1995; Table 1, p.8). This was paired with a follow up question to get a sense of their willingness and speed in adopting new technologies in general. Finally, participants were asked whether they had ever beta tested a new technology to get a sense of willingness to innovate on top of inclination to adopt proven technology.

4.5.1 The Importance of Various Qualities when Adopting Technology

(7) Please rate the importance of the following qualities when looking at adopting a technology:

Variable	None	Low	Moderate	Strong	Don't Know	
Being able to try the technology and its features before purchasing	0 0.0%	3 4.8%	12 19.0%	47 74.6%	1 1.6%	Total: 63
Seeing the technology used all over the place	1 1.6%	9 14.3%	27 42.9%	25 39.7%	1 1.6%	Total: 63
It's better than what you're using now or other products available	0 0.0%	4 6.5%	25 40.3%	31 50.0%	2 3.2%	Total: 62
The technology is very easy to use, simplistic and intuitive	0 0.0%	0 0.0%	10 15.9%	53 84.1%	0 0.0%	Total: 63
The technology is easily compatible with your life	2 3.2%	5 8.1%	14 22.6%	39 62.9%	2 3.2%	Total: 62

Table 9 – The Importance of Various Qualities when Adopting Technology

Overall

Overall, 75% of respondents indicated that being able to try a technology and its features before purchasing it had a strong importance in their decision. 84% indicated that the importance of the technology being very easy to use, simplistic and intuitive was strongly important to their decision to adopt, and was the quality with the greatest number of strong responses. (Table 9, p.59) The quality with the least strong responses was seeing the technology used all over the place, with only 40% indicating it was a strong factor in their decision to adopt. (Figure 8, p.60)

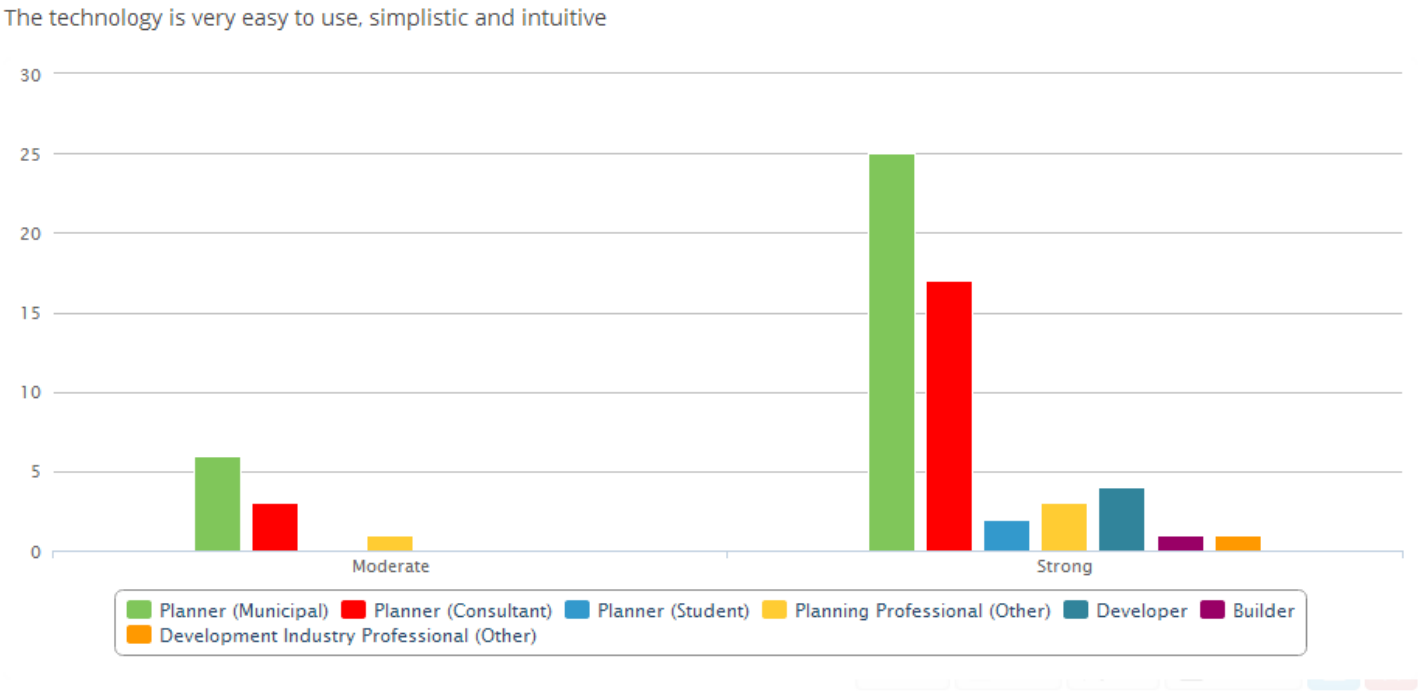

Figure 8 – Level of Importance that the Technology is Very Easy to Use, Simplistic and Intuitive

Municipal Planners

Municipal planners indicated at a rate of 77% that being able to try the technology and its features before purchasing had a strong importance on their decision to adopt.

Interestingly, the technology being better than what is used now, described as "relative advantage" by Rogers (1995), had the second lowest "strong importance" response, with 42% of municipal planners indicating it would strongly influence their decision to adopt. Ease of use, simplicity and an intuitive design had the greatest impact with 81% indicating it was of strong importance.

Consultant Planners

Consulting planners were slightly less likely to rate trialability of strong importance at 70%, but were more likely to be influenced by seeing the technology used other places. Consultants also indicated that improvements over the technology they were currently using had a greater influence at 53% on their willingness to adopt a new technology. This again touches on the opposing, deterministic view on technology adoption, which believes that an innovation is likely to succeed simply because it is better. (Lieven del Marez, 2011; Surry, 1997; Slater & Mohr, 2006)

4.5.2 Pace of Technology Adoption

Overall

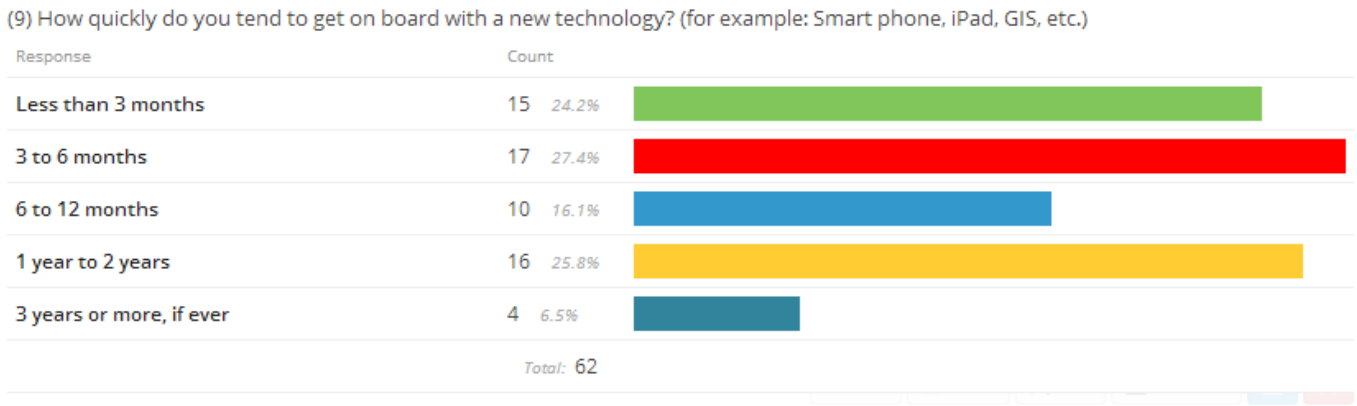

Figure 9 - Pace of Technology Adoption

The distribution for pace of technology adoption was relatively even and bucked the basic assumption of Rogers symmetrical bell shaped curve of five adopter segments. 24% of participants responded less than 3 months. In comparison, Rogers' "innovators" segment is assumed to be 2.5%. (Rogers, 1995; Surry, 1997) The next fastest to adopt came in at 27%, adopting in 3 to 6 months, exactly twice the assumption made by Rogers at 13.5%. Adoption then experienced a sharp drop to 16% between 6 and 12 months. Rogers assumes this category – the "early majority" – makes up 34% of adopters. (Rogers, 1995; Surry, 1997) (Figure 9, p.61)

This is interesting and may be indicative of one of Rogers greatest criticisms, a chasm for technology adoption as explored by Searls, noting a difficulty in bridging the gap between those who want "technology and performance, and customers who want solutions and convenience." (Searls, 2003) (Figure 1, p.14)

Municipal Planners vs. Consultant Planners

Municipal planners had the greatest number of responses in the 3 to 6 month category, but were also likely to be innovators, with 27% responding in the less than 3 months category. They were also the only group to have responses in the laggard, "3 years or more, if ever" category with 13%. While consulting planners were less likely to be innovators, with 15% responding in the less than 3 months category, their adoption rate was steadier, with 35% adopting between 3 and 6 months, and 25% for each 6 to 12 months and 1 to 2 years, much more in line with Rogers assumptions of segmented adopter categories.

Age

Along with assumptions for sizes of segmented adopter categories, Rogers assumes age plays a factor in individual innovativeness. (Rogers, 1995; Surry, 1997) When cross tabulated against age, adoption rates followed interesting patterns. 25 to 34 year olds followed very closely to the standard adoption curve, although with a bias towards innovation along with a marked chasm in adoption in the 6 to 12 month timeframe, then a rebound in the 1 to 2 year adoption time.

35 to 44 year olds showed skepticism in early adoption, gaining adoption strength as time increased, the opposite of 55 to 64 year old respondents who showed a tendency towards innovation and early adoption. This later in life tendency towards innovation goes against Rogers' assumptions surrounding age. However, it is important to note that Rogers' breakdown of personal characteristics of innovators and laggards such as age, gender, education level and social circle were not necessarily meant to be separated as direct influences on the individual innovation decision process, but are being tested in this study for discussion. As well, as discussed in the survey respondent breakdown, respondents to this survey are generally very highly educated, and this, taken into account along with age, as well as other factors, may explain the discrepancy.

Gender

Exploring another of Rogers assumptions in isolation, gender was expected to have an impact on pace of adoption, as the theory of diffusions presupposess the tendency of innovators to be young males. (Lieven del Marez, 2011; Parasuraman and Colby, 2001) However, the significance of the impact was shocking. Of those who responded in the

innovator category, noting that they tend to get on board with a new technology within less than 3 months, 80% were male and only 20% were female. (Figure 10, p.64)

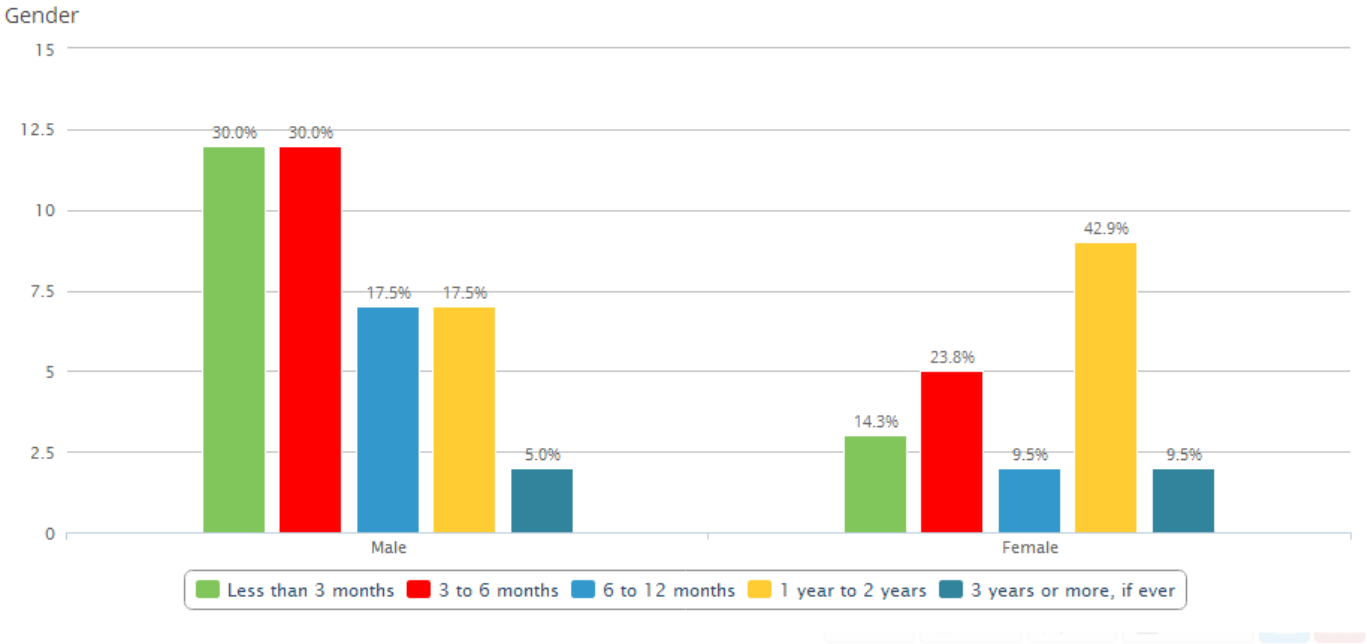

Figure 10 - Effect of Gender on Pace of Adoption

Men were more than twice as likely to adopt within 3 months with 30%, and women were also almost twice as likely to indicate they wouldn't adopt until 3 years later, if ever with 9.5%, compared to 5% of men.

It is difficult to even explain these results as simply isolating one of Rogers' assumptions, as could be the case in cross tabulating against age, since this reaffirms the assumptions. The effect of gender on the results seem even more surprising when you take into account that this was a self-selecting survey about the process for adopting technology, 98.5% of which had a Bachelor's Degree or higher and work in an industry that requires moderate technological use on a daily basis. While this could be taken as a discouraging

statistic, it also shows the greatest opportunity for growth in early adoption of technology is by increasing uptake by women.

4.5.3 Beta Testing

Overall

Overall, 31.3% of participants responded that they have previously been a beta tester. When broken down by profession, municipal planners were slightly less likely to have beta tested than consulting planners, with 29% and 38.1% respectively. Age did not seem to have a significant impact on the ratio of those who had or had not previously beta tested. Those between the ages of 18 and 24 and 65+ were the only age ranges where more respondents had beta tested than not. Gender, once again, had a dramatic effect on the likelihood of beta testing with 95% of participants who indicated they had previously beta tested were male.

4.5.4 Conclusion

In conclusion, if technology is to have a role in addressing aspects of development control that have been highlighted in this survey by respondents as areas for improvement, the most important quality across professions is ease of use, simplicity and intuitive design. The technology must also have trialability, allowing potential customers to use the technology and its features before committing.

Observability, seeing the technology used elsewhere, had less of an impact on the potential adoption. This was echoed by the general willingness to adopt quickly, with over

50% over participants responding that they adopted most technologies within the first 6 months, allowing little time for observability to factor into their adoption decision.

The sobering effect of gender on technology adoption was by far the key takeaway from the role of technology in improving the development control process. Women's aversion to technology adoption may be the greatest hurdle, but is also the greatest opportunity for increasing early adoption and buy in for innovation in development control.

CHAPTER 5 – CONCLUSION

In summary, key findings from this study centred on three themes; the opportunities for innovation in the development control process, barriers to innovation in the development control process, and the role of technology in innovating the process.

Opportunities for Innovation in the Development Control Process

This study assumes that there may be opportunities for innovation in the development control process. Questions centred on the level of satisfaction with different aspects the current process revealed a generally neutral to somewhat satisfied response. This was mostly unexpected, especially when it came to qualities such as the use of hard copy forms or the method of payment available. However, when asked about the level of interest in innovating these same aspects to allow for online submissions and payment options, the vast majority of respondents were very interested.

This points to a discrepancy between the perceived satisfaction with the current process and the actual satisfaction, which could be due to a number of factors. For one, the process has remained largely the same for years. This may allow those involved to confuse familiarity and comfort with an imperfect system for actual satisfaction with that system. This became apparent only when participants of this study were confronted with potential and possibly unforeseen changes to the system to which they respond favourably. In the context of this study, the high level of interest in innovating various aspects of the development control process supports the original assumption that the current process has room for improvement.

Barriers to Innovation in the Development Control Process

This study also assumes that municipal planners and those inside the system are likely to have different, and potentially more resistant views to innovation than those that interact with the process from the outside. This was evident throughout the survey, and was not surprising when it came to levels of satisfaction with being able to find the correct information such as cost, deadlines or zoning information. Municipal planners have the advantage of being intimately familiar with their specific website and relevant information, while consulting planners may work with a variety of municipalities, and their dissatisfaction could be reflective of the lack of a standard way to find pertinent information.

Barriers to implementation centred on perceived and real costs, especially on the municipal side. This was expected and was identified in the literature review by Slotterback in her look at the willingness of planners to adopt technology with regards to public participation. (Slotterback, 2011) Opportunities to address this barrier through shifting of costs to front end versus back end operations may be possible as consulting planners were less likely to respond that cost was as strong of a barrier to adoption.

However, areas where municipal and consulting planners agreed centered on the impact of development application approvals due to internal circulation times and subsequently conflicting comments from different departments. Both were aligned on the strong impact this has on the process. Streamlining communication once the application has been received and is circulated to internal departments is a pronounced opportunity to

improve the experience of the development control process for both municipal and consulting planners.

The Role of Technology

This study presupposes that technology has a role in addressing opportunities for innovation in the development control process. Areas where participants expressed very strong interest, such as the ability to submit development control applications and process payments online are clear facets of the process where opportunities for improvement through technological innovation exist. Other opportunities, such as streamlining internal communication, could be addressed through more traditional improvements such as updated roles and responsibilities, staff communication or working groups. However, addressing these issues in a fulsome online process that offers a simplistic, easy to use experience not only from the front end, but from the back end as well, delivers a solution to other identified barriers such as the process complexity. Respondents revealed that an appetite for innovation in the development control process exists and that technology has a major role in addressing these current frustrations, hurdles and inefficiencies.

Those who deal with the process from the outside; consulting planners, developers and other development professionals, are eager to see improvements. This research has shown that technology has a starring role to play in innovating the development control process and addressing opportunities and barriers within that. The greatest opportunities lie in elimination of inefficiencies experienced in internal communication breakdowns and when conflicting comments are received. Interest in the foundation of developing an online process, the ability to submit and pay for applications, was very high, outweighing barriers.

In conclusion, this study has produced an analysis of the opportunities and barriers to adoption of an online development control process in municipalities across Ontario, Canada and has set the stage to begin out of house development of an application to innovate the current process.

CHAPTER 6 – RECOMMENDATIONS

Through initial research for this study, it became evident that technological innovation in planning focused on advancing tools of the trade. Research on creating more advanced mapping, databases and access to data, modelling of current and future conditions, and analyzing trends was widely available. However, little focus was paid to innovation of processes central to urban planning.

While clear breakdowns of the current development control process were found to exist, levels of satisfaction, especially from inside the process, were shockingly high. However, when confronted with aspects of innovation, interest levels from those both inside and outside the process were even higher. This points to complacency as the culprit for lack of progress rather than reluctance to innovate, and encourages the following recommendations.

Standardization

As research for this study was ongoing, various municipalities have begun to take notice of opportunities to update the development control process and tackle in house solutions to online submissions. This is a great first step in the right direction and will undoubtedly work towards improving the process for municipal planners and consultants, developers and builders who work exclusively within those municipalities.

However, one of the takeaways from this research centers on the frustration from outside consulting planners who deal with multiple municipalities at different levels and

are unable to have to same intimate working knowledge of the process compared to municipal planners. The quality of technology that was most strongly responded to as having an impact on the decision to adopt was ease of use, simplicity and intuitive design. While each municipality may adhere to these principles, the most easy to use, simplistic and intuitive system is one that is universal. Standardizing this process between municipalities gets at the underlying inefficiencies and frustrations of dealing with unnecessarily unique circumstances for every application.

Standardization also speaks to the user-driven instrumentalist theory, taking into account the user as the force of change and also the social structure into which an innovation is to be diffused. The mismatch between how municipalities see development control and how users see development control, much like the original discrepancy between Alexander Graham Bell's perceived versus actual use of the telephone, fails to take into account the latent demand for the social aspect of development. (Horrigan, 2010)

Providing a standardized platform across municipal boundaries opens the door to leveraging the social aspect of the pillars of adoption currently overlooked by the development control process, and more difficult to implement across differing pieces of infrastructure. This was exemplified by the eventual governmental consolidation of networks during early electricity and telephone infrastructure build outs. (Horrigan, 2010; Table 3, p.7) Competing networks led to problems with connectivity, and standardization allowed for greater social connection and "that, in turn, fostered additional investment and consumer adoption." (Horrigan, 2010, p.5)

Further Research

Organizational Adoption

This research aimed to expose the opportunities and barriers for innovation in the development control process and the role of technology in addressing those at the individual development industry professional level. This provided, through Rogers' theory of the individual innovation decision process, a baseline understanding of the appetite for adoption in the population of users. However, an accepted limitation of this study notes that while municipal, consulting and other development industry professionals may have an appetite for innovation in the process, they are often not the same individuals that make decisions at the organizational level. Further research , likely qualitative in depth interviews will build on this quantitative study and expose opportunities and barriers at the organizational decision making level that were not explored in this study.

Other Planning Processes

Development control represents one process central to urban planning. Further research into the innovation of other externally facing processes such as public participation, and extensions of the development control function including building and construction permits could benefit from a fresh look at the opportunities for progressive innovation.

Gender and Technology in Planning

One of the most surprising findings of this research was the pronounced effect of gender on the willingness to adopt technology and the general interest in early adoption as

expressed by only 5% of women ever beta testing. While gender and technology research is far from new, further examination of the effect of gender on technology in the planning industry may be warranted.

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APPENDICES

Appendix I: Survey Link in OPPI Newsletter

Provincial Policy Statement

The new Provincial Policy Statement, 2014 (PPS, 2014) was released on February 24th and the policies take effect April 30, 2014. The PPS, 2014 contains the province's policies concerning land use planning for Ontario. The Ministry of Municipal Affairs and Housing has also released the annual planning calendar in partnership with the Ontario Professional Planners Institute (OPPI). The calendar features the PPS, 2014 with policy highlights by monthly theme. The calendar can be downloaded here.

Calling all Full Members!

Would you like to help young professionals advance their career as an RPP? OPPI is asking Full Members to lend their experience and expertise to help new, Candidate members achieve RPP certification. If you are have been a Full Member for 3 or more years, the Professional Standards Board(PSB) would love to include you as a Sponsor or a Mentor.

Please log into your Member Profile, click on "Volunteer Opportunities" and then "Programs" to indicate your interest. Following this, the PSB will contact you with more information. We appreciate your leadership and commitment to Ontario's planning community.

Research Survey- Online Development Approval?

What are your experiences with the development approval process? Share your thoughts on the potential for online tools to play a role through this survey, part of graduate student research at the University of Waterloo. We just need 10 minutes of your time to fill out this survey . Thank you!

CPL & Upcoming Events

Have you made your learning plan for 2014? Plan so that you can get the most out of your continuous professional learning activities! Attend OPPIDistrict and Partnership events. These are important educational and networking events. In addition, attendance at these events may count as "organized and structured activities" for OPPI members undertaking Continuous Professional Learning.

Members should consult Sections 2.3 and 2.4 (including Table A) of the CPL Guide. The reporting deadline for each reporting period (year) is December 31st. Members may submit their CPL report for the preceding year up until June 30th. Please note that when you are adding CPL activities on your Member Profile, in the upper right hand corner you get to designate which year the Learning Units should count towards. So when you are entering activities, consider whether you are still completing your 2013 CPL requirement, or you have started working on your 2014 requirement. In future years, further to section 3.5 of the CPL Program Guide, penalties may be applied for "late reporting."

- City of Oshawa 2014 Urban Design Awards- Accepting Calls for Nominations from December 3, 2013- March 14, 2014
- Ontario's Environmental Bill of Rights: A Toolkit for Change- March 4th
- 8th Annual Young Planners Networking Event- March 5th
- Planning Consideration for Medical Marijuana Facilities- March 6th
- OPPI SWOD March Movie Night- March 6th

Appendix II: Online Survey

www.fluidsurveys.com/s/waterloothesis

Welcome!

You are invited to participate in a research study conducted by Mary Riemer, under the supervision of Dr. Clarence Woudsma, Director, School of Planning at the University of Waterloo, Canada. The objective of the research study is to understand the opportunities and barriers for the adoption of an online development application process in Ontario municipalities. The study is for a Master of Art's thesis.

If you decide to volunteer, you will be asked to complete a 10-minute online survey that is completed anonymously. Survey questions focus on your experience with the development approval process and technology adoption in general and your perspectives on the potential for online tools in this process. Participation in this study is voluntary. You may decline to answer any questions that you do not wish to answer and you can withdraw your participation at any time by not submitting your responses. There are no known or anticipated risks from participating in this study.

It is important for you to know that any information that you provide will be confidential. All of the data will be summarized and no individual could be identified from these summarized results. Furthermore, the web site is programmed to collect responses alone and will not collect any information that could potentially identify you (such as machine identifiers).This survey uses FluidSurveys ™ which is a Canadian based survey company.

The data, with no personal identifiers, collected from this study will be maintained on a password-protected computer database in a restricted access area of the university. As well, the data will be electronically archived after completion of the study and maintained for two years and then erased.

Should you have any questions about the study, please contact either **Mary Riemer at** *mrwbriem@**uwaterloo.ca*** **or Clarence Woudsma at** ***cwoudsma@uwaterloo.ca***.. Further, if you would like to receive a copy of the results summary of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please feel free to contact Dr. Maureen Nummelin in the Office of Research Ethics at 1-519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you for considering participation in this study.

Consent to Participate: I agree to participate / I do not wish to participate

Survey Instrument.

1. **Please rate your familiarity with the development control process:**

Very Unfamiliar	Unfamiliar	Neutral	Familiar	Very Familiar

2. **Please select what you believe describes you best:**

Planner (Municipal)	Planner (Consultant)	Planning Professional (Other)	Development Industry Professional (Other)
Developer	Real Estate Professional	Builder	Other

3. **Based on your experience with the development control process, please describe your satisfaction with the following:**

	Very Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Very Satisfied	Don't Know
Your local municipality's website						
The ability to find correct and appropriate development control process information *(cost, deadlines, zoning information)*						
The ability to find the correct forms *(severance, minor variance, demolition permit, etc.)*						
Ease of filling out the application						
Availability of assistance						
Use of paper/hard copy forms						
Method of payment *(cheque)*						
Hours of operation to submit application *(Business hours:*						

8:30am – 4:30pm)						
Feedback received *(approval / denial, reasons why)*						
Appeal process *(committee of adjustment)*						
Personal interaction with Planners or City Staff						
The development control process (in general)						

4. **Based on your experience, what level of impact do the following considerations have on the time it takes for development application approvals?**

	None	Low	Moderate	Strong	Don't Know
Municipality considering the application to be complete					
Circulation time between necessary internal departments					
Conflicting comments from different departments or agencies					
Scheduling or attending meetings					
Scheduling or attending public consultation when essential					
Number of changes or further work needed					
Speed of response from applicant					
Speed of response from internal or municipal staff					
Fulfilling conditions of approval					

5. **How interested would you be in the following?**

	Not interested	Low interest	Neutral	Some interest	Very interested	Don't Know
The ability to submit your development application online						

The ability to pay for your development application online						
The ability to receive assistance with your application in real time over the phone or online outside of business hours						
The ability to receive feedback from the municipality about your application online						
The ability to adjust your application without reapplying						

6. **Based on your experience, what level of impact do the following considerations have on adopting a new online process?**

	None	Low	Moderate	Strong	Don't Know
Initial capital software cost					
Ongoing maintenance costs					
Training time / cost					
External stakeholder concerns					
Internal stakeholder concerns					
Legal issues					
Process complexity					
Integration with existing processes					

☐ Other _____

7. **Please rate the importance of the following qualities when looking at adopting a technology:**

	None	Low	Moderate	Strong	Don't Know

[Trialability] **Being able to try the technology and its features before purchasing**					
[Observability] **Seeing the technology used all over the place**					
[Relative Advantage] **It's better than what you're using now or other products available**					
[Complexity] **The technology is very easy to use, simplistic and intuitive**					
[Compatibility] **The technology is easily compatible with your life**					

9. **How quickly do you tend to get on board with a new technology?** (for example: Smart phone, iPad, GIS etc.)

- ☐ Less than 3 months
- ☐ 3 to 6 months
- ☐ 6 to 12 months
- ☐ 1 year to 2 years
- ☐ 3 years + if ever

10. **Have you ever been a beta tester?** (Y/N)

Demographic questions:

Age:	18-24	25-34	35-44	45-54	55-64	65+	
Gender:	Male	Female					
Highest Level of Education:	Secondary School Diploma	Some College	College Diploma	Some University	Bachelor's Degree	Master's Degree	Ph.D.
City of Residence:							
City of Employment:							

Appendix III: Full Results

Consent to Participate

Response	Chart	Percentage	Count
I agree to participate.	100%	100%	64
I do not wish to participate.	0%	0%	0
	Total Responses		**64**

(1) Please rate your familiarity with the development control process:

Response	Chart	Percentage	Count
Very unfamiliar	8%	8%	5
Unfamiliar	0%	0%	0
Neutral	5%	5%	3
Familiar	34%	34%	22
Very Familiar	53%	53%	34
	Total Responses		**64**

(2) Please select what you believe describes you best:

Response	Chart	Percentage	Count
Planner (Municipal)	48%	48%	31
Planner (Consultant)	33%	33%	21
Planner (Student)	3%	3%	2
Planning Professional (Other)	6%	6%	4
Developer	6%	6%	4
Real Estate Professional	0%	0%	0
Builder	2%	2%	1
Development Industry Professional (Other)	2%	2%	1
	Total Responses		**64**

(3) Based on your experience with the development control process, please describe your satisfaction with the following:

	Very Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Very Satisfied	Don't Know	Total
Your local municipality's website	5 (7.8%)	18 (28.1%)	9 (14.1%)	28 (43.8%)	3 (4.7%)	1 (1.6%)	64
The ability to find correct information (cost, deadlines, zoning, information, etc.)	6 (9.4%)	19 (29.7%)	8 (12.5%)	23 (35.9%)	7 (10.9%)	1 (1.6%)	64
The ability to find the correct forms (severance, minor variance, demolition permit, etc.)	3 (4.8%)	9 (14.3%)	7 (11.1%)	27 (42.9%)	16 (25.4%)	1 (1.6%)	63
Ease of filling out the application	3 (4.7%)	8 (12.5%)	13 (20.3%)	27 (42.2%)	10 (15.6%)	3 (4.7%)	64
Availability of assistance	3 (4.8%)	14 (22.2%)	12 (19.0%)	11 (17.5%)	18 (28.6%)	5 (7.9%)	63
Use of paper / hard copy forms to submit application	9 (14.1%)	8 (12.5%)	12 (18.8%)	18 (28.1%)	12 (18.8%)	5 (7.8%)	64
Method of payment	3 (4.7%)	5 (7.8%)	13 (20.3%)	19 (29.7%)	18 (28.1%)	6 (9.4%)	64
Hours of operation to submit application (Business hours: 8:30am-4:30pm)	1 (1.6%)	9 (14.1%)	13 (20.3%)	16 (25.0%)	23 (35.9%)	2 (3.1%)	64
Feedback received (approval, denial, reasons why)	4 (6.2%)	16 (25.0%)	10 (15.6%)	15 (23.4%)	12 (18.8%)	7 (10.9 %)	64
Appeal process (committee of adjustment)	2 (3.1%)	9 (14.1%)	15 (23.4%)	20 (31.2%)	11 (17.2%)	7 (10.9 %)	64
Personal interaction with Planners or City staff	0 (0.0%)	10 (15.9%)	12 (19.0%)	15 (23.8%)	24 (38.1%)	2 (3.2%)	63
The development control process (in general)	5 (7.8%)	15 (23.4%)	14 (21.9%)	20 (31.2%)	9 (14.1%)	1 (1.6%)	64

(5) How interested would you be in the following?

	Not Interested	Low Interest	Neutral	Some Interest	Very Interested	Don't Know	Total
The ability to submit your development application online	2 (3.1%)	3 (4.7%)	6 (9.4%)	16 (25.0%)	35 (54.7%)	2 (3.1%)	64
The ability to pay for your development application online	0 (0.0%)	2 (3.2%)	9 (14.3%)	9 (14.3%)	38 (60.3%)	5 (7.9%)	63
The ability to receive assistance with your application in real time over the phone or online outside of business hours	4 (6.2%)	8 (12.5%)	11 (17.2%)	20 (31.2%)	19 (29.7%)	2 (3.1%)	64
The ability to receive feedback from the municipality about your application online	0 (0.0%)	3 (4.7%)	8 (12.5%)	25 (39.1%)	26 (40.6%)	2 (3.1%)	64
The ability to adjust your application without reapplying	0 (0.0%)	4 (6.3%)	8 (12.7%)	8 (12.7%)	38 (60.3%)	5 (7.9%)	63

(6) Based on your experience, what level of impact do the following considerations have on adopting a new online process?

	None	Low	Moderate	Strong	Don't Know	Total
Initial capital software cost	2 (3.1%)	5 (7.8%)	14 (21.9%)	37 (57.8%)	6 (9.4%)	64
Ongoing maintenance costs	2 (3.2%)	7 (11.1%)	23 (36.5%)	25 (39.7%)	6 (9.5%)	63
Training time / cost	1 (1.6%)	7 (10.9%)	22 (34.4%)	28 (43.8%)	6 (9.4%)	64
External stakeholder concerns	0 (0.0%)	11 (17.2%)	29 (45.3%)	17 (26.6%)	7 (10.9%)	64
Internal stakeholder concerns	0 (0.0%)	7 (10.9%)	27 (42.2%)	24 (37.5%)	6 (9.4%)	64
Legal issues	0 (0.0%)	7 (10.9%)	19 (29.7%)	27 (42.2%)	11 (17.2%)	64
Process complexity	0 (0.0%)	6 (9.7%)	25 (40.3%)	29 (46.8%)	2 (3.2%)	62
Integration with existing processes	0 (0.0%)	7 (11.1%)	16 (25.4%)	37 (58.7%)	3 (4.8%)	63

(7) Please rate the importance of the following qualities when looking at adopting a technology:

	None	Low	Moderate	Strong	Don't Know	Total
Being able to try the technology and its features before purchasing	0 (0.0%)	3 (4.8%)	12 (19.0%)	47 (74.6%)	1 (1.6%)	63
Seeing the technology used all over the place	1 (1.6%)	9 (14.3%)	27 (42.9%)	25 (39.7%)	1 (1.6%)	63
It's better than what you're using now or other products available	0 (0.0%)	4 (6.5%)	25 (40.3%)	31 (50.0%)	2 (3.2%)	62
The technology is very easy to use, simplistic and intuitive	0 (0.0%)	0 (0.0%)	10 (15.9%)	53 (84.1%)	0 (0.0%)	63
The technology is easily compatible with your life	2 (3.2%)	5 (8.1%)	14 (22.6%)	39 (62.9%)	2 (3.2%)	62

(9) How quickly do you tend to get on board with a new technology? (for example: Smart phone, iPad, GIS, etc.)

Response	Chart	Percentage	Count
Less than 3 months	24%	24%	15
3 to 6 months	27%	27%	17
6 to 12 months	16%	16%	10
1 year to 2 years	26%	26%	16
3 years or more, if ever	7%	7%	4
	Total Responses		**62**

(10) Have you ever been a beta tester?

Response	Chart	Percentage	Count
Yes	31%	31%	20
No	69%	69%	44
	Total Responses		**64**

Age:

Response	Chart	Percentage	Count
18-24	6%	6%	4
25-34	50%	50%	32
35-44	14%	14%	9
45-54	16%	16%	10
55-64	11%	11%	7
65+	3%	3%	2
	Total Responses		**64**

Gender

Response	Chart	Percentage	Count
Male	67%	67%	42
Female	33%	33%	21
Other	0%	0%	0
	Total Responses		**63**

Highest Level of Education

Response	Chart	Percentage	Count
Secondary School Diploma	0%	0%	0
Some College	0%	0%	0
College Diploma	2%	2%	1
Some University	0%	0%	0
Bachelor's Degree	64%	64%	41
Master's Degree	33%	33%	21
Ph.D	2%	2%	1
	Total Responses		**64**