SOCIAL INFLUENCE AND TELECOMMUTING

EXPLORING THE RELATIONSHIP BETWEEN SOCIAL INFLUENCE AND TELECOMMUTING

By

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ABSTRACT

As cities continue to expand, the environmental impacts associated with increasing car usage remains an issue of concern. However, telework, an alternative form of working arrangement, has the potential to reduce the impacts associated with driving. In this study, we investigate how social interaction impacts the decision to telecommute. Data are obtained from the McMaster Telework Online Survey, which collects detailed information from McMaster University employees concerning their knowledge and experience with telework, feelings and opinions about home-based work and other lifestyle choices, and other information related to telecommunications. A unique characteristic of the survey is that it captures interactions among colleagues at work. The "colleague connection" measures the extent to which social interactions influence an individual's decision to adopt telework. The results of this research indicate that social interactions at work, as well as socio-demographic and work-related characteristics, do influence an individual's decision to adopt telework.

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PREFACE

This thesis is presented as a summary of related manuscripts and includes the following two chapters:

Chapter 2 Exploring Factors Underlying the Decision to Telecommute
Submitted to Transportation Research Board (TRB) for publication

Chapter 3 Investigating the Effects of Social Influence on the Choice to
Prepared for submission to Urban Studies for publication

The journal articles have been co-authored with Drs. Darren M. Scott, Antonio Páez, and Robert D. Wilton of the School of Geography and Earth Sciences at McMaster University. However, the thesis author was responsible for the content for each chapter in the thesis. Some of the tasks include defining research objectives, compiling and reviewing past literature, organizing and analyzing the data, estimating models, interpreting results, and composing the content for each chapter. Dr. Darren M. Scott's involvement in the thesis includes creation of the survey instrument (in collaboration with Dr. Antonio Páez, Dr. Robert D. Wilton, and Chris Benoit, the programmer), data collection (in collaboration with Dr. Antonio Páez), recommendation of research methods, discussion of empirical results, critical assessment of the manuscripts prior to submission to journals, and editorial advice.

Chapter 1 Introduction

1.1 Introduction

1.1.1 Environmental Concerns

Since 1908, when Henry Ford started the production of the Model T, North Americans have been able to enjoy the luxury of the automobile (Scott et al., 1997). Overtime, the use of automobiles has become a threat to the quality of North American urban environments. For instance, vehicles are contributing harmful pollutants, such as volatile organic compounds, oxides of nitrogen, and carbon monoxide emissions, to the environment (Fullerton and West, 2000). These car emissions are contributing to the deterioration of air quality and affecting the global climate, which is a potential threat to global warming (Golob and Hensher, 1998; Wade et al., 1994). Reducing the number of car trips on the road, especially during peak hours of the day, would be ideal for decreasing the negative impacts on the environment. Telecommunications provide the flexibility to work from home instead of the traditional workplace. Hence, this segment of the workforce requires no car trips to and from the traditional workplace, which could help alleviate some of the environmental issues that driving causes.

1.1.2 History of the Study of Telework

The concept of telework is not a new phenomenon (Harpaz, 2002). In fact, most people worked near or at home prior to the Industrial Revolution. In present day, work is done within an organizational framework. The employee-organization interaction occurs

with the aid of technological developments and modern channels of communications. In the 1970s, there was an oil crisis, which lead to the emergence of the term and concept of teleworking and the acceptance that teleworking was an alternative to commuting physically to and from the traditional workplace (Mokhtarian and Salomon, 1994). Telework was viewed as the means to alleviate some of the issues related to congestion and air pollution by reducing energy consumption (Mokhtarian and Salomon, 1994). The term, telecommuting, was created by Jack Nilles when he was 'stuck in traffic in Los Angeles' (Kurland and Bailey, 2000). Nilles defined the concept of telecommuting as 'all work-related substitutions of telecommunications and related information technologies for travel' (Nilles, 1988). Whilst the environmental concerns remained (e.g. Gillespie et al., 1995; Anderson, 2001), other aspects associated with the concept of telecommuting appeared in the 1980s and early 1990s (Haddon and Lewis, 1994).

In the 1980s, as more employees gave teleworking a chance, this concept was seen as a flexible form of workplace arrangement, which resulted from firms' need to adjust to the changes in the market (Haddon and Brynin, 2005). There was also a feminist interest surrounding the topic of telework. In the literature, it was noted that telework could be the solution for women who were trying to balance their work and home life (Olsen and Primps, 1984). In addition, there is a large number of researchers who have examined the pros and cons of telework arrangements (for example, Olson and Primps, 1984; Ramsower, 1985; Gerson and Kraut, 1988; Korte et al., 1988; Di Martino and Wirth, 1990; Huws et al., 1990; Kraut, 1987, 1988, 1989; Daniels et al., 2001; Harpaz, 2002).

In more recent years, with advancements in technological developments, such as the increased availability of inexpensive and speedy computers (Harpaz, 2002), telecommuting has been more accessible and less expensive to utilize. Interest in telework in the research community has also grown. The literature in this field of study consists of both optimistic futuristic predictions for use of telework, as well as negative criticisms associated with the impacts of teleworking.

There are research studies that focused on travel-related impacts of telework (Pendyala et al., 1991; Andrey et al., 2004), methods to reduce commuting trips (Mokhtarian, 1991), land planning (Handy and Mokhtarian, 1995), changing the organization of the existing central workplace (Sims et al., 1996), the role of computer-mediated communication (CMC) within organizations (Contractor and Eisenberg, 1990; Fulk et al., 1990; Schmitz and Fulk, 1991), and telework and transportation substitutions (Mokhtarian and Salomon, 1997; Illegems and Verbeke, 2003).

More recently, researchers have concentrated on exploring telework as 'knowledge work' (Bentley and Yoong, 2000; Pyöriä, 2003), examining the gender perspectives on the topic of teleworking (Beasley et al., 2001; Gurstein, 2001), addressing the family issues related to teleworking (Baines and Gelder, 2003), and social dimensions of teleworking (Páez and Scott, 2007; Martinez-Sanchez et al., 2008; Páez et al., 2008).

1.1.3 Origin of the Term and Concept of Telework

The meaning of the word, telework, is embedded in the words itself. 'Tele' originates from the Greek prefix, which means 'distant' or 'from a distance' (InnoVisions Canada, 2008). When 'tele' and 'work' are combined, the meaning becomes 'work from a distance' (InnoVisions Canada, 2008). The meaning of the word, telework, may be that simple, however, the definition of the concept of telework is more complicated.

The terms 'telework' and 'telecommuting' are sometimes used interchangeably. Sometimes, the two terms are distinguished and have slightly different definitions. For instance, Nilles (1998) refers to teleworking as the substitution of information technologies for travel pertaining to work. On the other hand, telecommuting is defined as work done outside the traditional office (at home or at a telework center), one or more days per week (Nilles, 1998). Currently, there is a lack of consensus over how the concept of telework should be defined. There are also issues surrounding the reasons for the multiple versions of the definition of the concept of telework.

1.1.4 Definitional Issues with the Term Telework

The concept of teleworking and/or telecommuting has no universally agreed definition. This issue stems from the fact that researchers have different beliefs as to which aspects should be included or excluded from the definition.

Definitions of teleworking from the past usually just mentioned work done away from the traditional workplace, such as the office (Grant, 1985; Kelly, 1985) or at home

(Regeneye, 1985). However, modern definitions appeared to cover a wider scope of aspects and tend to refer to the use of Information and Communication Technologies (ICTs) (Holti and Stern, 1986; Olsen, 1988). An example of a definition of teleworkers that was utilized in a survey on teleworking (IRS, 1996a) would be: employee who spend at least half their time working away from their companies' or organizations' main work location and require the use of a telecommunications tool in order to telework (Daniels et al., 2001). This definition of teleworkers is an example of how complicated and detailed a definition can be.

Sometimes, it is useful to have a systematic approach when defining a term. For example, Illegems and Verbeke (2003) suggested 5 variables that should be included within the definition of telework: (1) the amount of time spent off the employer's property, (2) the location of the work, (3) the type of work contract with the employer, (4) the type of technology used, and (5) the work status (e.g. full-time, part-time) (Illegems and Verbeke, 2003). This method could be of great use to organizations that are struggling to find the perfect definition for telework and would like to follow a systematic approach to defining this workplace arrangement.

There may not be a consensus on one definition anytime soon. Thus, it is important to focus on what is relevant to the organization and the employees of that organization, and to use the term, telework, in a way that will satisfy the worker-organization system. For this specific project, the definition of telework that was used in the survey questionnaire was '... a flexible form of workplace arrangement that allows

people to work from home in lieu of commuting to a conventional work location'. The definition was chosen for its simplistic nature.

1.2 Significance of Study

The gaps in the literature, significance, contributions, and motivations of the research topic, exploring the relationship between social influence and teleworking, are discussed in the following paragraphs.

First, the travel behavior aspect of teleworking has already been studied in great depth in the United States (Mokhtarian and Salomon, 1996a; 1996b; Saxena and Mokhtarian, 1997; Mokhtarian and Bagley, 2000), but less so in Canada (Alston, 1997). Thus, this project provides a Canadian viewpoint on telework adoption and contributes to the existing Canadian body of literature in this field of study.

In addition, the current literature in the field of travel behavior and social implications is quite limited with only several exceptions. For instance, the study by Axhausen (2006) focused on the ongoing effects of social networks and travel behavior and studies by Dugundji and Walker (2005) and Páez and Scott (2007) examined the relationship between social influence and travel behavior. Thus, this thesis contributes to the growing body of literature issues associated with travel behavior and social implications.

Furthermore, studying telework adoption is relevant given that telework adoption is not solely technologically driven, but could involve other dynamics, such as social, cultural, and political implications. Thus, this project focuses on the social implications

associated with telework adoption. In addition, the study of social networks as part of activity-travel behavior is important because it helps to strengthen our existing travel models with a deeper understanding of the social formations in everyday life (Carrasco and Miller, 2006). Overall, relatively little research has been done to explore the potential influence that social interactions between colleagues may have on individual decision-making. People are social beings in their everyday activities, especially at the workplace. Thus, it is necessary to examine the potential influences that social contacts may have on activities at work, such as the decision to adopt telework. This project helps with the understanding as to why or how telework is adopted by organizations and employees. In addition, this study provides a better understanding of why organizations adopt this innovative practice and how people are motivated to adopt this increasingly popular work arrangement.

This project also contributes to data collection efforts by providing empirical data collected from the online McMaster Telework Survey, which contains information on employees' knowledge, thoughts, and feelings regarding telework adoption. The data collection effort may also provide groundwork for other researchers to base their studies upon. Likewise, this project also contributes to the work-organization system. For instance, understanding telework from a social perspective could help utilize strategies to promote telework amongst employees and/or management. Results from this study could help management understand the motivations behind telework adoption. Thus, this understanding could contribute to new techniques to help motivate employees to adopt telework if that is the goal of the organization.

Nevertheless, the two key issues driving this research topic include the balancing act between time spent at work and time spent with family and friends, as well as the concern with potential negative impacts of increasing use of private automobiles on the environment (Fullerton and West, 2000; Golob and Hensher, 1998; Wade et al., 1994). Hence, telework provides the flexibility to work from home instead of the traditional workplace and requires no car trips to and from work. Therefore, studying telework adoption could help in the search for the ideal solution to minimize or diminish some or all of the environmental issues associated with driving private vehicles, as well as to help individuals increase time spent with family and friends.

1.3 Research Objectives

This research project has been developed with two objectives: 1) to explore the factors, attitudes, and perceptions that influence people's decisions to pursue telework and 2) to investigate the effect of social interactions on individuals' decisions to adopt telework. The significance of the first objective is that exploring the factors, attitudes, and perceptions that influence people's choices to telework provide a better sense of the teleworking scene at McMaster University. Furthermore, the significance of the second objective is that examining the effect of social interactions on the decision to adopt telework may contribute to a better understanding of why some people choose to telework, while others do not.

1.4 Layout of Thesis Chapters

Including this introductory chapter, this thesis consists of four chapters: 1) Introduction, 2) Exploring the factors driving the decision to telecommute, 3) Investigating the effects of social influence on the choice to telework, and 4) Conclusions. This project utilizes the primary data source from the McMaster Telework Survey. This survey was conducted at McMaster University in the Hamilton Census Metropolitan Area (CMA), Canada during February and March 2009.

The second chapter focuses on exploring the data from the McMaster Telework Survey to provide an overall sense of the data being analyzed. Description of the sample, results from the chi-square tests, a map of the teleworkers' and non-teleworkers' homes and workplaces, as well as a comparison of the observed and reported commute distances are provided in this chapter. The results provide the first attempt to understand telework adoption at a detailed level within an academic institution.

Chapter 3 takes the understanding of McMaster University employees' decision to adopt telework to the next level through the analysis of the social implications on decision-making. This chapter focuses on the effects of the colleague connections, the unique aspect of the McMaster Telework Survey. The colleague connections measured the extent to which social interactions influence an individual's decision to adopt telework by asking employees to indicate which colleague(s) they were associated with and to provide some additional information about the selected colleague(s). Therefore, the colleague connections offers a social dimension to the complex issue: why do some individuals telework, while others do not?

The final chapter of this thesis reviews the foci and outcomes of the project. Following that, the key contributions of the study are discussed before ending with final thoughts on directions for future studies.

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Chapter 2 Exploring Factors Underlying the Decision to Telecommute

2.1 Introduction

In the 1970s, there were very optimistic futuristic visions that telework adoption would increase. For example, Nilles (1988) made the prediction that by 1995, in the United States, there would be 21.2 million workers adopting telework, which would represent approximately 25% of all information workers or 15% of the workforce. Along the same lines of thinking, in 1971, AT&T forecasted that half of all Americans would choose to work from home by 1990 (Sturesson, 1998). In addition, Toffler (1980) believed that teleworking would 'take off' if the right technology was available (e.g., inexpensive and rapid computers, speedy and reliable communication lines, and internet expansion).

Nevertheless, all of the past predictions have been debunked. Current statistics on the teleworkers show that the forecasts were over-optimistic. It is extremely difficult to find the same statistics across studies in the United States and globally because the definition of teleworkers varies greatly and there are methodological issues involved (Kraut, 1987, 1988; Qvortrup, 1998; Shafizadeh et al., 1997). The range for the calculated proportions in the workforce depends on geographical location (e.g., 4 - 11% in Canada (Lowe and Schellenberg, 2001) and 1 - 6% in the United States (Bailey and Kurland, 2002)). Statistics Canada (2001) reported that in 1998, there were 900,000 Canadian employees working from home. Furthermore, in 1997, there were 11 million teleworkers in the United States (FIND/SVP, 1997) and in 1994, there were 1.25 million

European teleworkers (Korte and Wynne, 1996). Overall, teleworkers remain a minority in the workforce.

Salomon (1998) discussed some of the reasons for the optimistic telecommuting forecasts. The first reason was due to the biases in the predictions, which were derived from 'wishful thinking', as well as incorrect or naïve analyses. The second reason stemmed from errors in the design stage of the project or the misinterpretation of research results. Kerrin and Hone (2001) also pointed out the assumption that telework would just take off if the right technology was available to support the workplace. In fact, when examining telework adoption, the social aspect must be considered as well. For instance, the telework adoption process can only work if managers and employees are ready to adjust to the new worker-organization form, as well as any additional changes that may occur within sociotechnical systems (within organizations and society).

Despite the small number of workers currently teleworking and the over-optimistic past forecasts, the rate of teleworkers has been increasing since the late 1980s. Thus, some researchers still predict a continuous growth in the number of teleworkers in the workforce (Hequet, 1994; Business Marketing Digest, 1991; Robertson, 2005). Regardless of the current statistics on teleworkers, telework is presently viewed as one of the most significant workplace arrangement trends (Nilles, 1994; Handy and Mokhtarian, 1996; Golob, 2000; Bailey and Kurland, 2002; Ellen and Hempstead, 2002; Hardill and Green, 2003; Johnson, 1999, 2003; Haddon and Brynin, 2005). With advancements in and availability of technology, telework adoption is still not as successful as previously predicted. The underlying reasons for why individuals decide to adopt telework remain

an issue of uncertainty. This study investigates this issue in hopes of shedding light on the matter surrounding telework implementation in organizations.

This study makes use of data collected from the McMaster Telework Survey. This survey is the first to gather data on the subject of telework adoption with the participation of staff and faculty members of McMaster University. Furthermore, this project contributes to data collection efforts by providing empirical data on employees' knowledge, thoughts, and feelings regarding telework adoption, as well as providing groundwork for other researchers to base their studies upon.

The descriptive analysis conducted on the data contributes to the understanding of the impacts that personal and work-related factors may have on an individual's decision to pursue telework. There is conflicting evidence in the literature regarding the factors that motivate telework adoption. Thus, the results from this study attempt to help strengthen some of the current findings and suggest areas where further research is needed to provide more concrete evidence for contrasting findings in the literature.

The McMaster Telework Survey was launched for the first time at McMaster University for collecting data on employees' knowledge, attitude, and perception of telework adoption. The data gathered from this survey provided the basis for accomplishing two objectives: 1) to obtain an overall sense of the data by exploring the socio-demographic, telework-related, and social influence characteristics of the sample, teleworkers' and non-teleworkers' homes and workplace locations, and the observed and reported commute one-way distances from home to work and 2) to examine the relationship between telework status and several suites of factors affecting telework

adoption – namely, job and workplace characteristics, ability to telework, telework and other lifestyle choices, views on various issues, socio-demographic characteristics, and colleague connections. Accomplishing these objectives could help resolve some of the issues regarding an individual's decision to adopt telework.

The remainder of this chapter contains the following sections: background studies, methodology, results and discussion, along with the conclusions.

2.2 Background Studies

2.2.1 Factors Affecting Telework Adoption

In the earlier discussions of telework, the advancements in the capability of technology and the decrease in its cost were believed to be promoters for telework (Handy and Mokhtarian, 1996; Toffler, 1980). However, the optimistic predictions for the increase in remote work have been debunked (e.g., Nilles, 1988; Sturesson, 1998). It is now evident that just having affordable and efficient technology alone does not equal a high success rate in telework adoption. The decision to pursue telework, whether it be part-time, full-time, home-based or center-based, is more complex and requires the consideration of other crucial aspects, such as suitability of job, support from the organization, interface between work and home, and personal factors. The following sections will include further explanations for each of the categories mentioned.

2.2.1.1 Suitability of Job

An individual's choice to adopt telework could depend on the nature of work at one's job and the suitability of technology for specific work-related tasks. Examples of suitable job traits include: high control in time spent on individual work and working with others remotely (little need for face-to-face interaction). Since information workers and sales and marketing personnel are examples of jobs that exhibit the appropriate characteristics, thus, employees with these types of occupations are more likely to pursue telework (Mokhtarian, 1998). On the other hand, occupations that require a physical presence, such as chefs, hair stylists, food service workers or firefighters, are not candidates for telework. Thus, it is important to note that examining specific details of the jobs rather than looking at the general job characteristics is a better predictor of whether an individual can pursue telework (Mokhtarian, 1998). Nevertheless, some jobs have selective tasks that can be completed remotely (away from the office). Therefore, some occupations fall at opposite ends of the spectrum (can or cannot telework), while others fall in between the extremes (can telework for some tasks or for some of the time).

2.2.1.2 Support from Organization

The decision to telework could also be affected by the willingness of management to permit and trust employees to work from home. The agreement from management to consent to telework is affected by the issues of status and power associated with certain types of occupation. For instance, when comparing professional and clerical jobs, both occupations have suitable job traits for telework, however, they do not have the same

opportunity to obtain permission to telecommute. Although both types of positions are deemed suitable for telework based on an assessment of general job characteristics, a number of studies indicate that employees with clerical positions may struggle to get permission from management to work from home (e.g., Huws et al., 1990; Mokhtarian et al., 1998; Olson and Primps, 1984; Tomaskovic-Devey and Risman, 1993). Thus, status and power may play a vital role in employees' ability to achieve management's approval to adopt telework.

Nonetheless, managers of different localities have their reasons for refusing to allow their employees to telework. Results from a survey of 4,000 European managers demonstrated that there are two main reasons that managers are opposed to telework: organizing telework programs is a hassle and they do not see any need for changing the traditional system (Huws et al., 1990). Issues of control and trust emerged from American studies (Harrington and Ruppel, 1999). Managers' lack of trust and fear of losing control over their employees play a large role in their decision to permit telework adoption (Harrington and Ruppel, 1999). The potential solution to these issues of control and trust as suggested by the literature (Pancucci, 1995; Huws et al., 1990) could be to incorporate new management methods, which would include shifting focus from observational approaches to implementing progress reports to assess deliverables.

Firm size is considered another possible factor driving telework adoption. However, there were diverse outcomes from studies, which included firm size. For example, a study by Huws et al. (1990) discovered that managers in large firms are more willing to accept telework, while other studies found the opposite result (e.g.,

Tomaskovic-Devey and Risman, 1993; Zamindar, 1996). The role of firm size in telework adoption needs further investigation to eliminate the contradicting conclusions.

2.2.1.3 Interface between Home and Work

The choice to telecommute could include other aspects, such as availability of office space at home, commute trip from home to work, and family relations. The availability of physical space for a home office could be a larger constraint in telework adoption in some places more than others. For instance, in Taipei, the relatively small living spaces may be a barrier to home-based telecommuting (Yen, 2000). Taipei is not the only place where small housing design is an issue for creating office space. In the United Kingdom, most dwellings cannot accommodate comfortable working space for telecommuters (Sullivan and Lewis, 1998). Thus, there are regional differences in the ability to create office space for telecommuting. Nevertheless, the availability of a separate workspace is an important aspect when deciding to take on telework (Baruch, 2000).

Commuting to and from work daily may take a toll on some people depending on how long the commute is or how stressful the traffic congestion may be. Thus, elimination of the commute trip could be a driving force behind current telecommuters. In several studies, it was documented that the commute trip from home to work is proportional to the propensity to adopt telework (Nilles, 1988; Mahmassani et al., 1993; Sullivan et al., 1993; Mokhtarian and Salomon, 1997). Thus, these past studies show that commute length has an impact on facilitating telecommunications. However, of the

individuals who are currently working remotely from the office, the commute trip has not been linked with the rate of teleworking (Mokhtarian, 1991).

Lastly, other factors, such as household distractions (Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997) and spending time with family (e.g., Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997; Bailey and Kurland, 2002; Mokhtarian and Salomon, 1994; Baruch, 2001) have been well documented as important predictors and contributors to the decision to adopt telework.

2.2.1.4 Personal Factors

The personal factors that could affect telework adoption include familiarity with technology, presence of young children, social isolation, and job satisfaction. Studies show that a high number of personal and household characteristics are significant in influencing one's choice to telecommute. Even though age has been acknowledged as one of the key aspects driving the decision to telecommute, results from a survey of 4,000 employees in Europe uncovered that interest in telework is positively related to one's experience with new technologies and negatively associated with their age (Huws et al., 1990).

With regards to presence of children in household, contrary to the popular hypothesis that family concerns, such as child care is a primary motivation for women to adopt telework, Huws et al. (1990) illustrate that the desire to telework is more common with couples with no children than couples with one or two children. This finding could

be explained by the a study done by Kinsman (1987) which reveals that working at home with young children is very challenging as reported by teleworkers.

Furthermore, a very consistent theme present in the literature is that social isolation from decreased social contact with colleagues is a barrier for telework implementation (Forester, 1989; Olson, 1988b; Pratt, 1984). Evidence from Pratt (1984) illustrated that workers (in particular single men and women) stopped telecommuting and returned to the office for social contact. Interestingly, studies revealed that part-time telework has minimal or no effect on communication within the organization (e.g., decreased frequency of communication and use of communication channels, exclusion from office network and selective communication between individuals) (Belanger, 1999; Duxbury and Neufeld, 1999). Thus, these selective studies have shown that infrequent telework practice could be the solution to social isolation (experienced or feared).

Another personal issue related to teleworking is evaluating satisfaction with current workplace arrangement. There are conflicting outcomes regarding job satisfaction in the literature. For instance, Bailey and Kurland (2002) reported that based on their review of the literature, the support for increased job satisfaction among telecommuters is weak and insubstantial, while Pinsonneault and Boisvert (2001) concluded that job satisfaction is one of the two outcomes that obtained the most notice among the experimental studies. It is evident that further research is needed on the issues of job satisfaction, social isolation, and other factors with inconclusive evidence.

Results from several large data collection efforts: the State of California pilot project (Olszewski and Mokhtarian, 1994), a phone survey of Finnish workers (Luukinen,

1996), the Workplace Employee Relations Survey, and the Labour Force Survey conducted in the United Kingdom (Felstead et al., 2002) revealed that most telecommuters were highly educated, had high incomes (higher than average), were middle-aged, and were male professionals. Overall, past studies have shown that personal factors have a significant impact on telework adoption.

2.2.1.5 Conclusions

Some studies have attempted to forecast the most predictive factor influencing one's choice to adopt telework. Studies by Mokhtarian and her colleagues (Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997) estimated models on a large sample of 500 public agency employees and uncovered that of all the types of variables included in the model (e.g., personal and household factors, job and work characteristics, issues regarding the home/work interface, and availability of technology), the work-related factors are most significant in one's decision to adopt telework. Specifically, management's willingness to permit telework appears to be the predominant work-related factor in predicting an employee's chance of being allowed to work remotely (Bailey and Kurland, 2002). By comparison, Doherty et al. (2000) conducted their own study and found that the key motivation for teleworking does not pertain to transport-related factors, but rather pertain to work and/or personal characteristics (Doherty et al., 2000). Bailey and Kurland (2002) were also along the same lines with their discovery that transport-related factors, such as the reduction of commuting were not the strongest drive for telework adoption as early telework researchers had forecasted.

The lack of conclusive evidence suggest that further research is needed to understand the factors influencing the decision to pursue telework.

Overall, current research suggests that the main division within the teleworking sectors is between occupational and gender differences (Bailey and Kurland, 2002). The differences result in teleworkers predominantly being male professionals or female clerical positions (Bailey and Kurland, 2002). Looking at the gender split only, some large studies reported that the teleworking population is nearly equally divided between males and females (e.g., International Telework Association and Council, 2000; Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996a, 1996b, 1997); while others studies state that men are dominating the telework sector (Luukinen, 1996; Olszewski and Mokhtarian, 1994).

The expected motivation for employees to adopt telework is not entirely clear due to gaps in the literature, which leaves an important question unanswered: why do some individuals telework, while others continue to commute to the traditional workplace? The results from this study could help untangle some of the uncertainties involving factors affecting telework adoption and/or confirm the validity of some of the existing findings in the literature.

2.3 Methodology

2.3.1 Study Area

The data for this study were collected at McMaster University, which is located in the Hamilton CMA, Canada. Hamilton is located in Southern Ontario and at the western

tip of Lake Ontario, approximately 70 kilometers southwest of the province's capital city, Toronto. This CMA has a population of 692,911 and was ranked as the 3rd largest city in Ontario and the 9th largest in Canada (Statistics Canada, 2006).

In addition, Hamilton has 347,485 individuals who are employed in the labor force with occupations in management, finance and administration, government service, recreation and sport, sales and service, transport and equipment operators, manufacturing and utilities. With regards to the place of work status, 21,480 employees work at home.

McMaster University has a large economic impact in Hamilton. Since McMaster makes use of the local businesses and suppliers, the cost to operate this institution benefits Hamilton's economic growth. McMaster has more than 7,500 employees (faculty and staff members), which makes it the 5th largest employer in the city (City of Hamilton, 2008). McMaster employees work at several locations: McMaster Main Campus, McMaster Innovation Park, McMaster Downtown Centre, Frid Building, Henderson Hospital, Chedoke Hospital, and St. Josephs Hospital (see Figure 1). In addition, the institution offers a wide variety of employment opportunities (e.g., occupations in management or administration, professional or technical, services or repair, clerical or administrative support, sales or marketing, production or construction or crafts and education or research, and other types of occupations). Since there is a large diversity in job types and a high number of employees at McMaster University, the faculty and staff members at this institution are ideal candidates for the study of telework adoption.

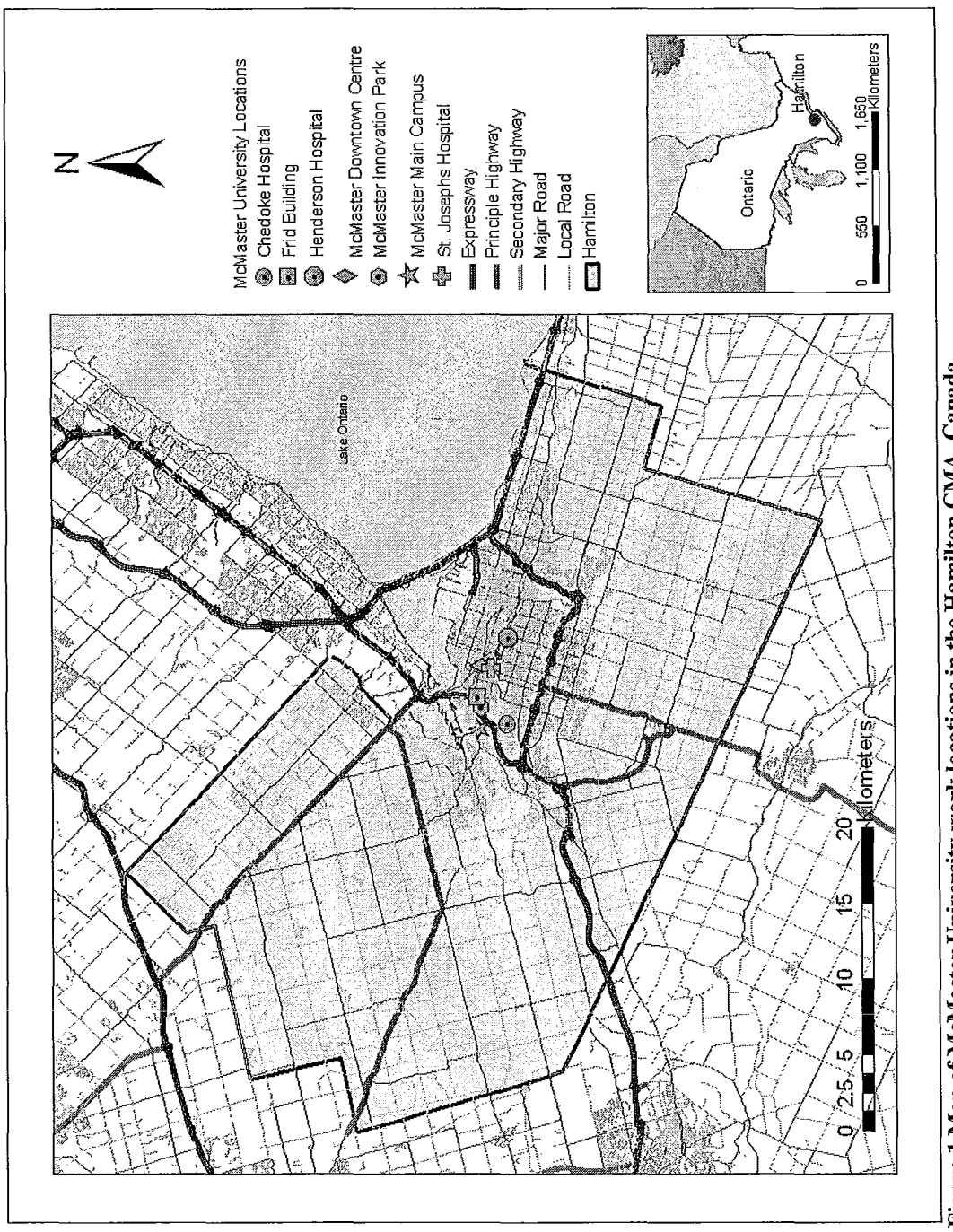

Figure 1 Map of McMaster University work locations in the Hamilton CMA, Canada.

2.3.2 Survey Design

Data for this project were obtained from the McMaster Telework Survey, a self-administered online survey. As an incentive to participate in the survey, each participant was entered into a draw for a chance to win 1 of 3 gift certificates valued at $200, $300 and $500. To enter the draw, participants had to complete the survey and provide their contact information by filling out the last section. The survey took approximately 20 to 30 minutes to complete and it was available for completion online during February and March 2009.

The survey was sent by email to McMaster university faculty members, management groups and staff members – approximately 4,000 invitations. Of the 4,000 surveys sent out, 936 were completed, which yielded an effective 23.4% response rate.

2.3.2.1 Purpose of Survey

The purpose of conducting this survey was to understand how people became aware of the concept of telework and how they made the decision regarding telework adoption. For this particular project, individuals' attitudes toward and perceptions about telework were of interest. Given current levels of adoption, it was important to understand why people do not telework, as much as why they do. Therefore, whether the participants had little or no experience with working from home or whether they had permission from management to telework, they were still encouraged to complete the survey.

2.3.2.2 Survey Content

The McMaster Telework Survey covered a wide range of questions and consisted of 7 distinct sections: 1) telework knowledge and experience, 2) job and workplace characteristics, 3) colleague connections, 4) ability to telework, 5) telework and other lifestyle choices, 6) views on various issues, and 7) demographic information.

In the first section: telework knowledge and experience, there were questions regarding the employees' previous experience that they had with working remotely. More importantly, there were specific questions to find out if they were presently teleworking, which provided their telework status. If they were not teleworking, then there were questions to find out their reasons for not telecommuting.

Job and workplace characteristics was the second theme in the survey. Respondents had the opportunity to provide information regarding the nature of their job: the type of tasks done at work and the extent to which they must be done in a particular location.

Colleague connections was the third section of the survey. This part of the survey contained telework-related questions on the individuals' colleagues.

Ability to telework was the section of the survey that examined employees' ability to adopt flexible workplace arrangements. In addition, there were questions inquiring about their opinion on the importance of potential advantages and disadvantages of telework.

The following section, telework and other lifestyle choices, considered the fact that some individuals may have wanted to start teleworking for a variety of lifestyle-

related reasons; yet, telework may not have been the only choice that was taken into consideration in response to those lifestyle needs. Thus, these questions collected information on employees' feelings about other possible choices that helped put their feelings about telecommunications into the proper context.

Views on various issues was the second last part of the McMaster Telework Survey, which asked about views on a variety of issues directly and indirectly related to telework. For example, some of the questions asked for their views on commuting trips to and from work, satisfaction with workplace arrangements, and importance of spending time with family and friends. There were no 'right', nor 'wrong' answers. Participants were free to give their honest opinion on these views.

The last section, demographic information, gathered personal and household information, as well as some information related to the individual's commute to and from work. The answers to these questions were important for generalizing the findings from the sample to the population as a whole.

2.3.3 Description of Sample

To narrow the focus down to only McMaster employees who indicated their telework status (currently teleworking or not), the final sample size of 936 was reduced to 731. Next, to gain a better understanding of the data being analyzed, several groups of variables were explored. Descriptive statistics were performed on socio-demographic and telework-related characteristics, as well as variables for colleague connections. In

addition, histograms were generated to observe the trends of frequencies of several of the variables.

The home and work locations of teleworkers and non-teleworkers were mapped, which showed the spatial differences between the teleworkers' and non-teleworkers' homes and the spatial distribution of their residences in proximity to the 5 main McMaster work locations.

Furthermore, there were two types of commute one-way distances from home to work in this project. The first type of commute distance was the distance that was reported in the survey questionnaire by the employee. The second type was the observed distance, which was the point-to-point network distance generated from the address of the employee's work location to the home addresses that were reported in the survey. A matched-pairs t-test was computed to test the difference between mean numbers of kilometers for observed and reported commute distances. Next, to determine if distances were related to the decision to telecommute, a two-sample difference of means t-test was computed.

2.3.4 Chi-square Tests

Several chi-square tests were conducted to test for the association between telework status and potential factors affecting the decision to telework. Telework status was the dependent variable and it was formed by the question that asked participants if they were currently teleworking or not. The potential factors affecting the decision to telework were taken from several sections of the survey: job and workplace

characteristics, ability to telework, telework and other lifestyle choices, views on various issues, and demographic information.

2.4 Results and Discussion

2.4.1 Description of Sample

2.4.1.1 Socio-demographic Characteristics of Sample

Summary statistics for the subsample (teleworkers and non-teleworkers only) are shown in Table 1. With regards to sex, there is a higher proportion of females than males, with 55.0% females and 18.2% males in the subsample. The highest proportion of the subsample falls in the age category 41 - 50 (24.5%). The age categories: 31 - 40 (17.5%) and 51 - 60 (16.7%) have the second and third highest proportion of respondents, respectively. The rest of the sample falls in the other age categories: 21 - 30 years old (6.8%) and over 60 years old (4.8%). The average household size is 2.9 persons with a standard deviation of 2.2. In addition, 14.6% of respondents have children age 5 or under within their household.

The modal annual household income (before taxes) category is $\geq$ $95,000 (40.5%). The second and third highest proportion of respondents reported household

Table 1 Socio-demographic, work-related, and telework-related characteristics of sample (N = 731).

Variable	Freq.	%	Std.
Socio-demographic characteristics			
Sex			
Female	402	55.0	-
Male	133	18.2	-
Unknown	196	26.8	-
Age (years)			
21 - 30	50	6.8	-
31 - 40	128	17.5	-
41 - 50	179	24.5	-
51 - 60	122	16.7	-
> 60	35	4.8	-
Unknown	217	29.7	-
Household size			
Average	2.9	-	2.2
Number of households with children < 6 years	107.0	14.6	-
Income ($)			
15,000 - 34,999	3	0.4	-
35,000 - 54,999	57	7.8	-
55,000 - 74,999	72	9.8	-
75,000 - 94,999	68	9.3	-
≥ 95,000	296	40.5	-
Unknown	235	32.1	-
Vehicle availability			
Average per household	1.7	-	1.2
Average per licensed driver	1.4	-	0.7
Work-related characteristics			
Commute to workplace			
Average reported commute time, one-way (minutes)	26.6	-	21.7
Average reported commute length, one-way (km)	22.8	-	71.9
Primary workplace			
Main Campus	534	73.1	-
Offsite location 1	8	1.1	-
Offsite location 2	54	7.4	-
Offsite location 3	3	0.4	-
Offsite location 4	10	1.4	-
Offsite location 5	10	1.4	-
Offsite location 6	27	3.7	-
Other primary workplace location	85	11.6	-
Occupation type			
Management or administration	151	20.7	-
Professional or technical	135	18.5	-
Services or repair	5	0.7	-
Clerical or administrative support	147	20.1	-
Sales or marketing	12	1.6	-
Production or construction or crafts	1	0.1	-
Education or research	190	26.0	-
Other	39	5.3	-
Unknown	51	7.0	-

Occupation tenure			
Average time (years) with present occupation	9.0	-	9.0
Average time (years) with present employer	10.6	-	9.7
Average time (years) with present department	9.7	-	9.3
Telework-related characteristics			
Heard of telework before survey			
Yes	507	69.4	-
No	223	30.5	-
Unknown	1	0.1	-
Telework status			
Presently teleworking	183	25.0	-
Presently not teleworking	548	75.0	-
Average years teleworked	2.3	-	5.3
Teleworked then stopped			
Yes	123	16.8	-
No	591	80.8	-
Unknown	17	2.3	-

incomes of $55,000 - 74,999 (9.8%) and $75,000 - 94,999 (9.3%), respectively; 7.8% of households have incomes of $35,000 - 54,999 and 0.4% of households have incomes of $15,000 - 34,999. With regards to vehicle availability, the average number of vehicles available per household is 1.7 and the average number of vehicles available per licensed driver is 1.4. On average, respondents travel 26.6 kilometers and 22.8 minutes one-way from home to work.

When reviewing the workplace characteristics, it is evident that the majority of the subsample worked at McMaster Main Campus (Westdale) (73.1%) and other primary workplaces (11.6%). The rest of the employees' workplaces are located at the offsite locations: McMaster Downtown Centre (7.4%), St. Joseph's Hospital (3.7%), Henderson Hospital (1.4%), Chedoke Hospital (1.4%), McMaster Innovation Park (1.1%), and the Frid Building (0.4%). In terms of occupation type, a high proportion of the sample works

in education or research (26.0%). The remaining sample works in management or administration (20.7%), clerical or administrative support (20.1%), professional or technical (18.5%), other (5.3%), sales or marketing (1.6%), services or repair (0.7%), and production or construction or crafts (0.1%). Next, examining the statistics of occupation tenure reveal that on average, respondents have been working in their present occupation for 9.0 years, employed with their present employer for 10.6 years, and working in their present department for 9.7 years.

2.4.1.2 Telework-related Characteristics of Sample

Summary statistics on telework-related characteristics of the subsample are shown in Table 1. One question asked if participants have heard of telework prior to receiving the survey and the statistics reveal that 69.4% have heard of telework and 30.5% have not.

Figure 2 shows the histogram of sources from which McMaster University employees had heard of telework. The histogram reveals that the top 3 sources where individuals heard telework from are the media, colleague at current workplace, and friend (not at workplace).

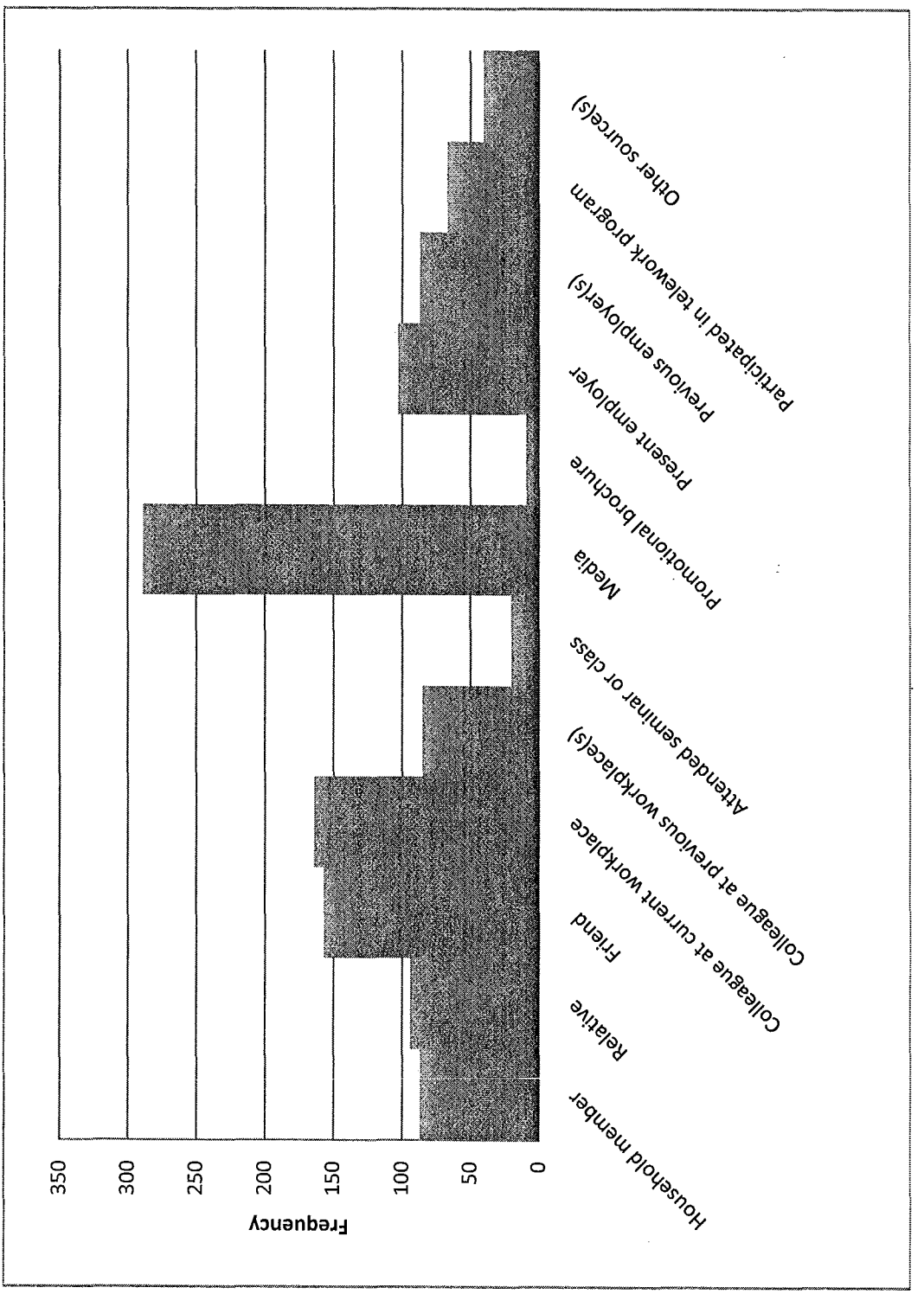

Figure 2 Histogram of sources where McMaster University employees heard of telework.

For telework status, 25.0% of the subsample is presently teleworking and 75.0% of the subsample is presently not teleworking. For individuals who answered yes to presently teleworking, they were subsequently asked about their average years teleworked and the statistics show that the average years teleworked is 2.3. For individuals who answered no to presently teleworking, their reasons for not teleworking were inquired. The histogram for the reasons for not currently teleworking (Figure 3) show that the top 3 reasons for why employees are not presently teleworking include: job is not suitable, present work responsibilities do not permit it, and never really thought about it. Figure 4 displays the histogram of the most important reasons for not adopting telework. The results uncover that disadvantages outweigh the advantages, job is not suitable, and have not discussed it with supervisor (but do not think he/she will permit it) are the most important reasons for not adopting telework.

Furthermore, the descriptive statistics reveal that 16.8% of the sample fall in the category of individuals who have teleworked in the past, but now have stopped. The histogram that was generated for reasons for discontinuing telework (Figure 5) exhibits that the three most common reasons are employer changed, need to be in the main workplace, and job duties changed.

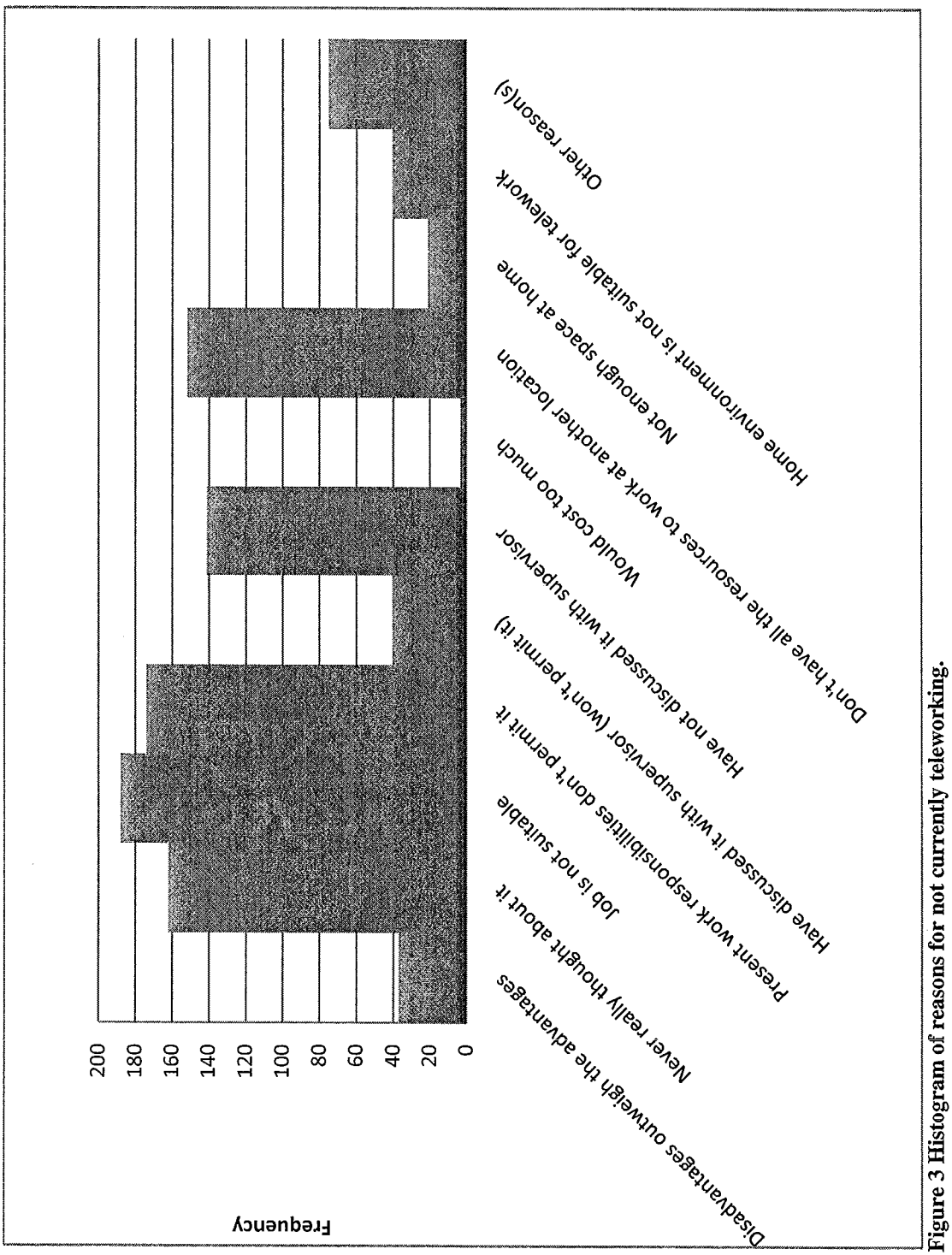

Figure 3 Histogram of reasons for not currently teleworking.

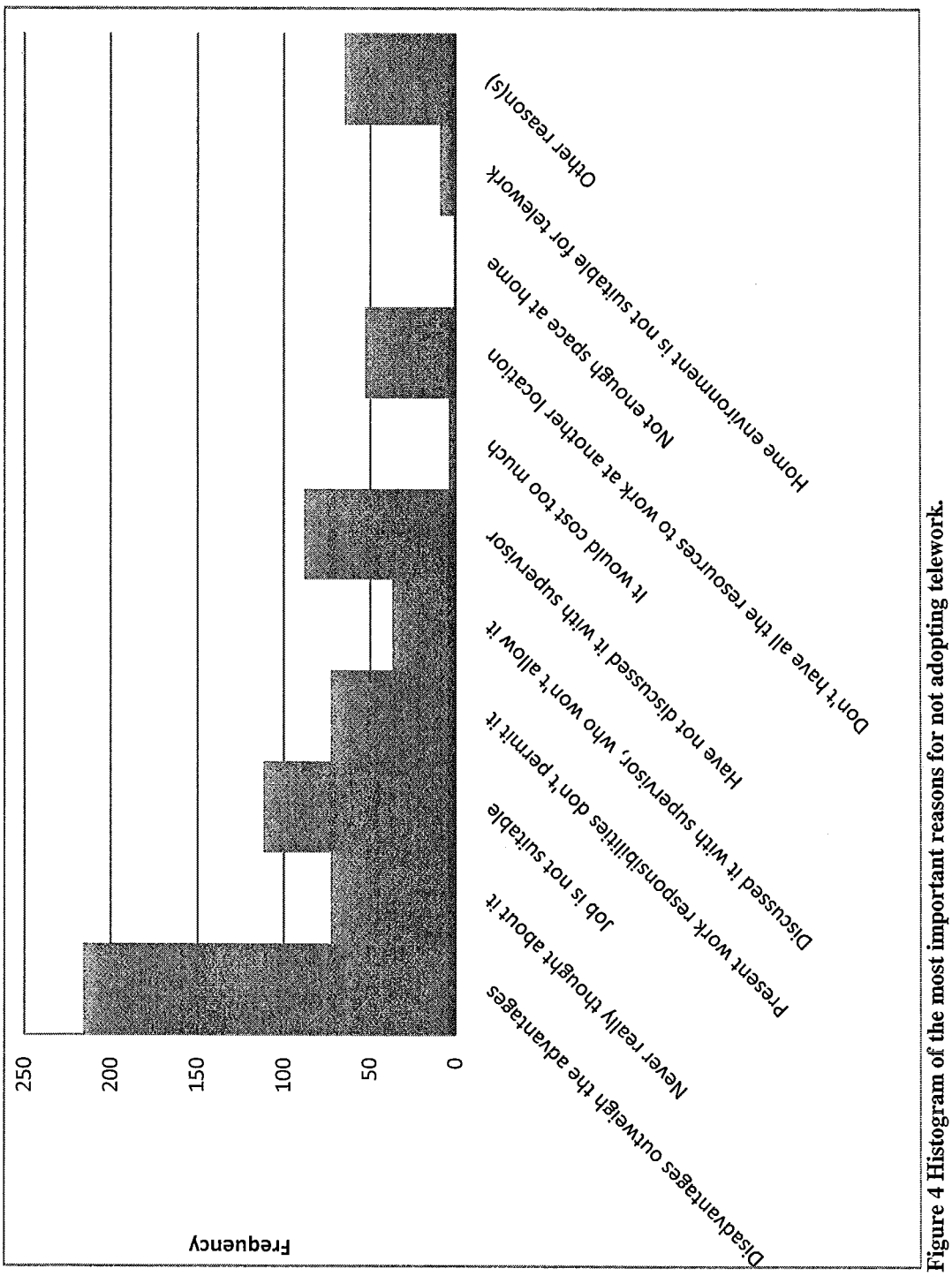

Figure 4 Histogram of the most important reasons for not adopting telework.

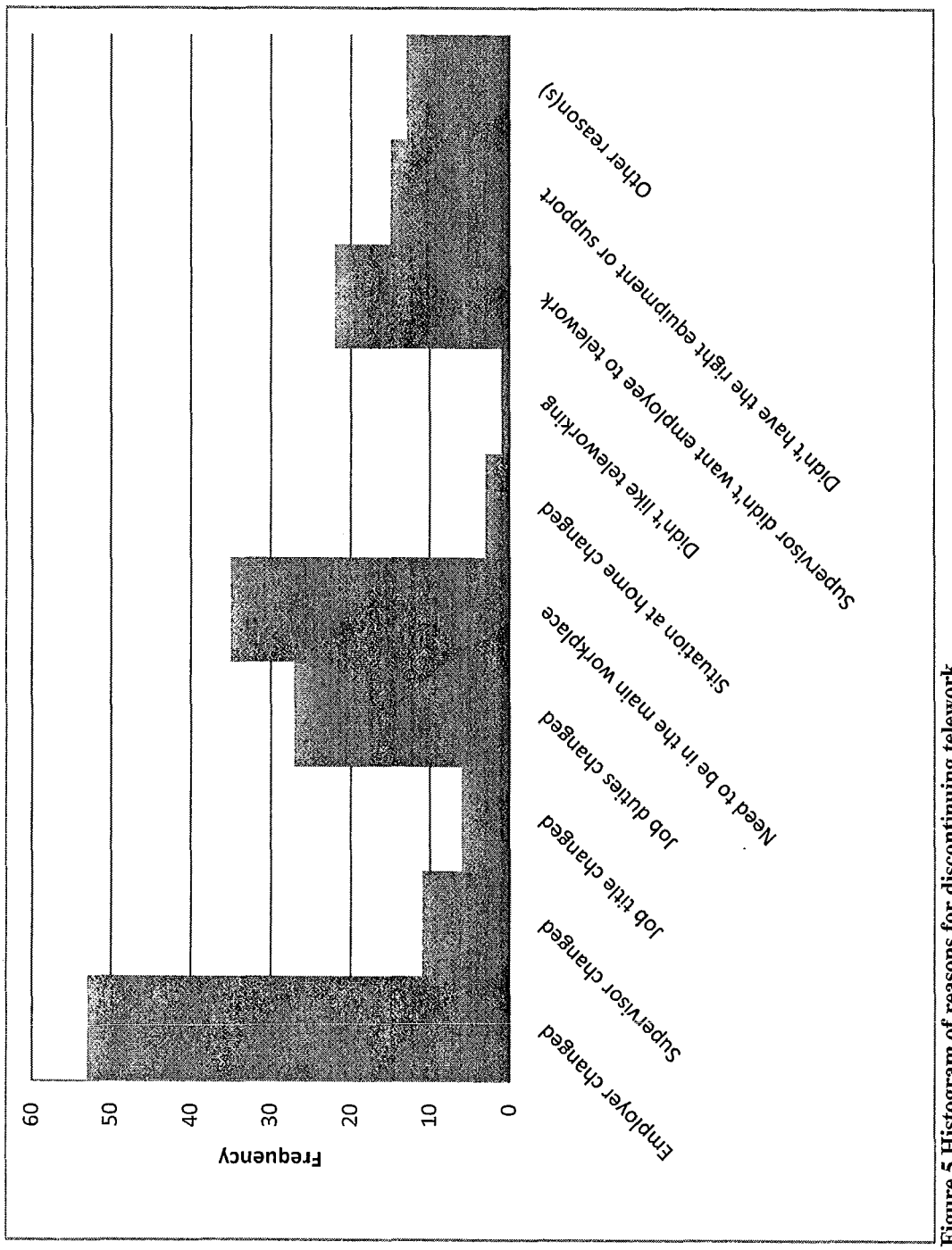

Figure 5 Histogram of reasons for discontinuing telework.

2.4.1.3 Description of Colleagues Connections Variables

Table 2 describes the variables from the colleague connections section of the McMaster Telework Survey. The sample consists of 477 individuals, who indicated their telework status and answered the colleague connections questions. As for the total number of colleagues that employees have in their social network, the minimum is 1 and the maximum is 562. When examining their colleagues' telework status, the average number of colleagues who are currently teleworking is 3.0 and the average number of colleagues who are not currently teleworking is 7.8. The statistics for the variable, spoke to colleague about telework show that on average, employees, who have adopted telework, speak to 0.3 colleagues about telework before telework is adopted and 0.6 colleagues about telework before telework is adopted. As for the colleagues, whose advice was sought from about work-related and other issues, on average, employees sought advice from 12.3 colleagues.

The results of the two-sample difference of means t-test for teleworkers and non-teleworkers are summarized in Table 3. The results reveal that there is no significant difference between teleworkers' and non-teleworkers' mean number of colleagues in his/her social network. As for colleagues' telework status, there is a significant difference between teleworkers' and non-teleworkers' mean number of colleagues who telework. There is also a significant difference between teleworkers' and non-teleworkers' mean number of colleagues who do not telework. Alternatively, teleworkers' mean numbers

Table 2 Description of colleagues' connection variables (N = 477).

		Colleague Telework Status			Spoke to Colleague About Telework*				Seek Advice From Colleague About Work-related and Other Issues	
Statistic	No. of Colleagues	Yes	No	Do not Know	Yes, Before Telework Was Adopted	Yes, After Telework Was Adopted	No	Do Not Remember	Yes	No
Min.	1	0	0	0	0	0	0	0	0	0
Max.	562	57	174	330	10	37	502	51	329	201
Mean	22.5	3.0	7.8	11.2	0.3	0.6	20.5	0.5	12.3	9.3
Std.	36.2	5.7	13.4	24.6	1.1	2.7	33.0	3.5	21.0	20.2

*Variable only pertains to telework adopters

Table 3 Results of the two-sample difference of means *t-test* for teleworkers and non-teleworkers.

Variable	Category	*t*-statistics	Mean Difference	Sig.
Number of colleagues in network		1.353	5.236	
Colleague currently teleworks	Yes	6.740	3.948	***
	No	-2.205	-3.139	**
	Don't know	1.424	3.752	
Seeks advice from colleague about work-related and other issues	Yes	-.229	-.514	
	No	2.567	5.513	**

Significance levels: *p < .10; **p < .05; ***p < .0001.

of colleagues who advice was sought from about work-related and other issues is no different from non-teleworkers' mean numbers of colleagues who advice was sought from. Interestingly, the largest difference in means in Table 3 arise when employees have colleagues who currently telework. The associated *p*-value of less than 0.0001 very strongly indicates that these sample means reveal significant differences in teleworkers' and non-teleworkers' knowledge of their colleagues' telework status.

Table 4 summarizes the results of the two-sample difference of proportions test for teleworkers and non-teleworkers. The results reveal that there is a significant difference in teleworkers and non-teleworkers between employees with colleagues who telework or colleagues who do not (for that pair, $Z_p = 2.947$and $p = 0.003$). Alternatively, the proportions of employees who seek advice from colleagues about work-related and other issues and employees who do not seek advice have a significant difference between teleworkers and non-teleworkers (for that pair, $Z_p = -1.394$ and $p = 0.0032$).

Table 4 Results of the two-sample difference of proportions test for teleworkers and non-teleworkers.

Variable	Category	z-statistic	Sig.
Colleague currently teleworks	Yes	2.947	**
	No		
Seeks advice from colleague about work-related and other issues	Yes	-1.394	
	No		

Significance levels: *p < .10; **p < .05; ***p < .0001.

Overall, teleworkers' and non-teleworkers' verbal communications with colleagues about telework have significant differences in means and proportions as shown in Table 3 and Table 4. Perhaps, the results indicate that social interactions at work do make a difference in individuals' decision to adopt telework.

2.4.1.4 Teleworkers and Non-teleworkers Locations

Figure 6 shows the mapped locations of teleworkers' and non-teleworkers' homes and five McMaster University workplaces. All the employees reside within Southern Ontario, however, majority of them live within Hamilton, with the exception of a few outliers (e.g., residences in Sudbury, Ottawa, Belleville, and Hastings Highlands). The map reveals that there are more non-teleworkers than teleworkers; yet, they both tend to cluster near the 5 workplaces in Hamilton. As for the non-teleworkers' dwellings

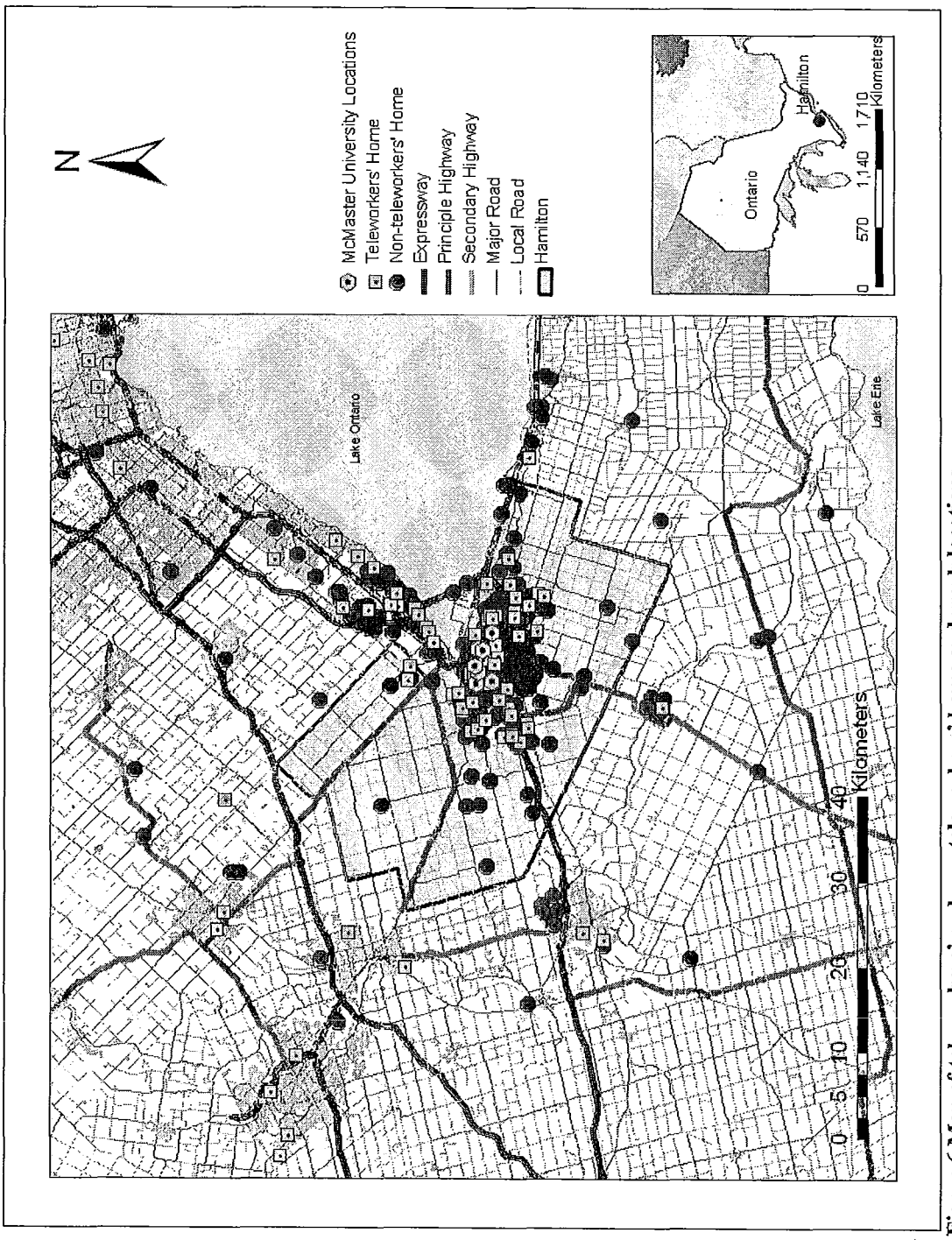

Figure 6 Map of teleworkers' and non-teleworkers' home and work locations.

that are not clustered near the 5 workplaces, they are scattered outwards from the cluster in a circular pattern towards Norfolk, St. Catharines, Toronto, and Kitchener, Ontario. As for the teleworkers, the homes that are not part of the clustering near the workplaces are scattered further north (in the Greater Toronto Area, Pickering, Guelph, and Waterloo). With regards to the four main outliners (e.g., Sudbury, Ottawa, Belleville, and Hastings Highlands), three out of the four outliers belong to telecommuters. Thus, the results illustrate that teleworkers' homes when compared to non-teleworkers' homes, even though they are fewer in number, tend to live slightly further from McMaster University's 5 main workplaces in Hamilton.

2.4.1.5 Comparison of Commute Distances

A matched-pairs t-test was computed to test for the difference between mean numbers of kilometers for observed and reported commute distances (see Table 5). The results suggest that there is insignificant difference between observed and reported commute distances. Therefore, the paired samples t-test fails to reveal a statistical difference between the mean numbers of kilometers for observed commute distance (M = 22.40, s = 47.18) and reported commute distance (M = 20.16, s = 36.37) for both teleworkers and non-teleworkers. Table 6 illustrates the results of the two-sample difference of means *t*-test between teleworkers' and non-teleworkers' observed commute one-way distances from home to work. The results from the *t*-test reveal that there is a significant difference between teleworkers' and non-teleworkers' observed commute distances. Overall, teleworkers have the longer commute trip from home to work.

Table 5 Results of the matched-pairs *t*-test for difference between mean numbers of kilometers for observed and reported commute distances.

Pair	*t*-statistic	Degrees of freedom	P-value
Observed commute distance Reported commute distance	.807	420	0.420

Table 6 Results of the two-sample difference of means *t*-test between teleworkers' and non-teleworkers' observed commute one-way distances from home to work.

Variable	Mean Commute Length (km)	*t*-statistic	P-value	Mean Difference between Observed Commute Distances
Teleworkers	40.612			
Non-teleworkers	16.879			
		4.459	0.000	23.733

2.4.2 Chi-square Tests

Chi-square tests for independence were computed for telework status (dependent variable) and potential factors affecting telework status (independent variables). Independent variables are from several sections of the McMaster Telework Survey: job and workplace characteristics, ability to telework, telework and other lifestyle choices,

views on various issues, and demographic information. Overall, there are 45 statistically significant variables out of the 88 variables that were tested. The following sections, which are organized by the sections of the survey that the independent variables are found in, summarize the results of the chi-square tests.

2.4.2.1 Job and Workplace Characteristics

Table 7 shows the comparison of teleworkers and non-teleworkers based on job and workplace characteristics. Interestingly, the result of occupation type being a variable of significance accords with the study by the Mannering and Mokhtarian (1995) and Mokhtarian and Salomon (1996b; 1997). Those previous studies also suggested that work-related factors are most important when it comes to the decision to adopt telework.

The insignificance of distractions from home affects teleworking in the test against telework status does not concur with other studies that have reported the opposite result (e.g., Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997). To understand the reason for the insignificant result, the frequencies of household distractions and age were compared (see Table 8). The results show that there are a high number of people who reported that distractions from home did not affect their telework status and fell in the age group: 41-50 years, which is the age group that would typically have children over 6 years of age. In addition, household distractions were compared with presence of children under 6 in the household (see Table 9). The findings reveal that there are a high number of people who reported that distractions from home did not affect their telework status and have no children under 6 years of age at home. Thus, age and

Table 7 Comparison of teleworks and non-teleworkers based on job and workplace characteristics.

Independent Variable	Sig.	Categories	Telework (%)			Non-telework (%)		
			Obs.	Exp.	Dif.	Obs.	Exp.	Dif.
Employee type	***	Faculty	49.1	21.0	28.1	11.7	21.0	-9.3
		Staff	50.9	79.0	-28.1	88.3	79.0	9.3
Type of individual supervised	***	No one	35.8	50.1	-14.2	54.6	50.1	4.6
		Staff	23.3	21.5	1.7	21.0	21.5	-0.6
		Students	40.9	28.4	12.5	24.4	28.4	-4.0
Occupation	***	Manager/ administration	22.0	22.2	-0.2	22.3	22.2	0.1
		Professional/ technical	16.1	19.9	-3.8	21.1	19.9	1.2
		Services/ repair	0.6	0.7	-0.1	0.8	0.7	0.0
		Clerical/ administrative support	7.1	21.6	-14.5	26.4	21.6	4.7
		Sales/ marketing	1.8	1.8	0.0	1.8	1.8	0.0
		Production/ construction/ crafts	0.0	0.1	-0.1	0.2	0.1	0.0
		Education/ research	47.6	27.9	19.7	21.5	27.9	-6.5
		Other occupation type	4.8	5.7	-1.0	6.1	5.7	0.3
Time spent in present occupation		Under 5 years	43.3	46.3	-3.0	47.2	46.3	1.0
		5 - 9 years	19.9	23.9	-4.0	25.2	23.9	1.3
		10 - 14 years	9.4	8.8	0.6	8.6	8.8	-0.2
		15 - 19 years	9.4	6.2	3.2	5.2	6.2	-1.0
		20 years or more	18.1	14.8	3.3	13.8	14.8	-1.1
Time spent with present employer		Under 5 years	36.8	37.2	-0.3	37.3	37.2	0.1
		5 - 9 years	21.1	25.8	-4.7	27.3	25.8	1.5
		10 - 14 years	8.2	8.8	-0.6	9.0	8.8	0.2
		15 - 19 years	11.7	8.8	2.9	7.8	8.8	-1.0
		20 years or more	22.2	19.5	2.8	18.5	19.5	-0.9
Time spent in present department	**	Under 5 years	38.0	39.8	-1.8	40.3	39.8	0.6
		5 - 9 years	24.0	26.2	-2.2	27.0	26.2	0.7
		10 - 14 years	6.4	11.2	-4.8	12.8	11.2	1.6
		15 - 19 years	8.8	7.2	1.6	6.7	7.2	-0.5
		20 years or more	22.8	15.6	7.2	13.2	15.6	-2.4
Time spent on individual work	**	0 hours	0.6	0.6	0.0	0.6	0.6	0.0

		Up - 8 hours	20.1	24.9	-4.8	26.5	24.9	1.6
		9 - 24 hours	38.5	42.6	-4.1	44.0	42.6	1.4
		More than 24 hours	40.8	31.9	8.9	29.0	31.9	-2.9
Time spent working with others, physically		0 hours	1.8	1.3	0.5	1.2	1.3	-0.2
		Up - 8 hours	49.7	53.2	-3.5	54.3	53.2	1.1
		9 - 24 hours	41.3	37.2	4.2	35.8	37.2	-1.4
		More than 24 hours	7.2	8.4	-1.2	8.8	8.4	0.4
Time spent working with others, remotely		0 hours	0.0	2.1	-2.1	2.7	2.1	0.7
		Up - 8 hours	41.9	42.8	-0.9	43.1	42.8	0.3
		9 - 24 hours	41.9	41.9	0.0	41.9	41.9	0.0
		More than 24 hours	16.2	13.2	3.0	12.2	13.2	-1.0
Time spent on work in a specific location	***	0 hours	20.9	38.5	-17.6	44.3	38.5	5.8
		Up - 8 hours	49.7	39.2	10.5	35.8	39.2	-3.4
		9 - 24 hours	19.6	11.2	8.4	8.5	11.2	-2.8
		More than 24 hours	9.8	11.1	-1.2	11.5	11.1	0.4
Time spent on work-related travel	**	0 hours	51.9	64.9	-13.0	69.2	64.9	4.4
		Up - 8 hours	43.2	32.2	11.0	28.5	32.2	-3.7
		9 - 24 hours	4.9	2.5	2.4	1.7	2.5	-0.8
		More than 24 hours	0.0	0.5	-0.5	0.6	0.5	0.2
Control in time spent on individual work	**	Low	0.6	2.9	-2.3	3.7	2.9	0.8
		Medium	10.0	15.9	-5.9	17.8	15.9	1.9
		High	88.8	80.1	8.8	77.2	80.1	-2.9
		Not applicable	0.6	1.2	-0.6	1.4	1.2	0.2
Control in time spent on working with others, physically		Low	12.4	17.2	-4.8	18.8	17.2	1.6
		Medium	54.7	51.8	2.9	50.9	51.8	-0.9
		High	31.8	29.7	2.1	29.0	29.7	-0.7
		Not applicable	1.2	1.3	-0.1	1.4	1.3	0.0
Control in time spent on working with others, remotely	***	Low	5.3	11.7	-6.4	13.8	11.7	2.1
		Medium	32.9	38.6	-5.7	40.5	38.6	1.9
		High	61.2	46.5	14.7	41.7	46.5	-4.8
		Not applicable	0.6	3.2	-2.6	4.1	3.2	0.9
Control in time spent on work in a specific location	**	Low	27.4	25.3	2.1	24.6	25.3	-0.7
		Medium	28.6	23.9	4.6	22.4	23.9	-1.5
		High	32.7	27.8	4.9	26.1	27.8	-1.7
		Not applicable	11.3	23.0	-11.7	26.9	23.0	3.9
Control in time spent on work-related travel	**	Low	17.3	20.1	-2.8	21.1	20.1	1.0
		Medium	18.5	18.3	0.2	18.2	18.3	-0.1

		High	29.2	18.9	10.3	15.4	18.9	-3.5
		Not applicable	35.1	42.7	-7.6	45.3	42.7	2.6
Ability to do part of job from home	**	Yes	99.4	94.2	5.2	92.5	94.2	-1.7
		No	0.6	5.8	-5.2	7.5	5.8	1.7
Ability to use borrowed computer from work		Yes	48.5	45.3	3.3	44.2	45.3	-1.1
		No	20.7	21.4	-0.7	21.6	21.4	0.2
		Don't know	17.2	22.6	-5.4	24.3	22.6	1.8
		Not applicable	13.6	10.8	2.8	9.8	10.8	-0.9
Distractions from home affects teleworking		Yes	15.4	15.2	0.2	15.1	15.2	-0.1
		No	78.1	80.0	-1.9	80.6	80.0	0.6
		Not applicable	6.5	4.8	1.7	4.3	4.8	-0.6
Has office space at home	**	Yes, an entire room	61.5	53.3	8.2	50.6	53.3	-2.7
		Yes, part of a room	32.0	34.3	-2.3	35.0	34.3	0.8
		No	6.5	12.4	-5.9	14.4	12.4	2.0
Could create office space at home for teleworking	*	Yes, an entire room	64.4	58.4	6.0	56.7	58.4	-1.7
		Yes, part of a room	34.9	38.2	-3.3	39.2	38.2	0.9
		No, not enough space at home	0.7	3.4	-2.7	4.1	3.4	0.8
Aware of household members also teleworking	***	Yes	25.7	8.6	17.1	3.1	8.6	-5.6
		No	74.3	91.4	-17.1	96.9	91.4	5.6
Aware of other relatives also teleworking	***	Yes	24.0	8.1	15.9	2.9	8.1	-5.2
		No	76.0	91.9	-15.9	97.1	91.9	5.2
Aware of neighbors also teleworking	***	Yes	16.4	4.9	11.5	1.1	4.9	-3.8
		No	83.6	95.1	-11.5	98.9	95.1	3.8
Aware of friends also teleworking	***	Yes	51.5	16.9	34.6	5.5	16.9	-11.3
		No	48.5	83.1	-34.6	94.5	83.1	11.3

Significance levels: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.0001$.

Table 8 Comparison of household distractions and age groups.

Distractions from home affects teleworking	Age Groups				
	21 - 30	31 - 40	41 - 50	51 - 60	60 +
Yes	6.7%	32.2%	41.1%	18.9%	1.1%
No	9.7%	24.0%	35.4%	24.6%	6.4%
Not applicable	8.0%	32.0%	24.0%	24.0%	12.0%
Total	9.2%	25.5%	35.8%	23.7%	5.9%

Table 9 Comparison of household distractions and presence of children under 6 years of age.

Distractions from home affects teleworking	Number of children under 6 years in household			
	0	1	2	3
Yes	78.9%	12.5%	7.0%	1.6%
No	88.8%	7.5%	3.7%	.0%
Not applicable	94.4%	5.6%	.0%	.0%
Total	87.6%	8.2%	4.0%	.2%

presence of children under 6 in the household may not be the contributing factors for individuals' distractions from home affecting teleworking. Perhaps, other aspects in the home could be acting as distractions affecting telework, such as, the temptation to do household chores, watch television, or leave the home to go shopping.

The independent variable "could create office space at home for teleworking" is also insignificant and does not coincide with previous studies on the topic of the availability of physical space for a home office and telework adoption (e.g., Yen, 2000; Sullivan and Lewis, 1998; Baruch, 2000). In this study, it is possible that the survey participants live in large enough homes that creating an office space is not an issue.

2.4.2.3 Ability to Telework

Table 10 illustrates the comparison of teleworkers and non-teleworkers based on ability to telework. The variable "amount of time supervisor would allow for teleworking" is similar to stopped teleworking due to supervisor disapproving telework. However, this variable involves the concept of time and is not one of the potential reasons why telework was discontinued. The amount of time supervisor would allow for teleworking was significant, which is in line with outcomes found elsewhere (e.g., Bailey and Kurland, 2002; Huws et al., 1990; Mokhtarian et al., 1998; Olson and Primps, 1984; Tomaskovic-Devey and Risman, 1993).

The importance of missing social interaction at work is significant in the chi-square test, which aligns with some studies who have reported that social interaction at the workplace is a crucial aspect of the working life (e.g., Forester, 1989; Olson, 1988b; Pratt, 1984; Pratt, 1984), while contrasting with others who believe that social interaction at work is something people can do without (e.g., Belanger, 1999; Duxbury and Neufeld, 1999). Interestingly, most of the significant variables relate to work (e.g., quantity of work done, career advancement, opinion of management, and work equipment), which is in line with other studies that have suggested that work-related aspects are driving forces in pursing telework (e.g., Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997).

Interestingly, the other potential disadvantage of teleworking: missing professional interaction at workplace is insignificant, which is opposite of the

Table 10 Comparison of teleworkers and non-teleworkers based on ability to telework.

Independent Variable	Sig.	Categories	Telework (%)			Non-telework (%)		
			Obs.	Exp.	Dif.	Obs.	Exp.	Dif.
Amount of time job would allow for teleworking	***	Not at all	0.0	5.1	-5.1	6.9	5.1	1.8
		Less than once a month	0.7	4.9	-4.3	6.4	4.9	1.5
		About 1 - 3 days a month	16.3	23.6	-7.3	26.2	23.6	2.6
		1 - 2 days a week	49.7	41.4	8.2	38.6	41.4	-2.9
		3 - 4 days a week	19.0	13.6	5.5	11.7	13.6	-1.9
		5 days a week	12.2	4.1	8.2	1.2	4.1	-2.9
		Occasional partial days	2.0	7.2	-5.2	9.0	7.2	1.8
Amount of time supervisor would allow for teleworking	***	Not at all	2.1	17.1	-15.0	22.4	17.1	5.3
		Less than once a month	3.5	8.7	-5.2	10.6	8.7	1.8
		About 1 - 3 days a month	15.4	22.6	-7.2	25.1	22.6	2.5
		1 - 2 days a week	48.3	31.1	17.1	25.1	31.1	-6.0
		3 - 4 days a week	16.8	7.3	9.5	3.9	7.3	-3.3
		5 days a week	10.5	3.1	7.4	0.5	3.1	-2.6
		Occasional partial days	3.5	10.0	-6.5	12.3	10.0	2.3
Importance of having more time for oneself[1]	*	Not at all important	17.5	24.5	-7.0	26.9	24.5	2.4
		Slightly important	28.0	29.3	-1.4	29.8	29.3	0.5
		Moderately important	30.1	23.9	6.2	21.8	23.9	-2.2
		Extremely important	24.5	22.3	2.2	21.5	22.3	-0.8
Importance of reducing stress of commuting[1]	*	Not at all important	19.4	24.4	-5.0	26.2	24.4	1.7
		Slightly important	27.1	24.4	2.7	23.5	24.4	-0.9
		Moderately important	18.1	22.4	-4.4	24.0	22.4	1.5
		Extremely important	35.4	28.7	6.7	26.4	28.7	-2.3
Importance of getting more work done[1]	**	Not at all important	2.8	8.3	-5.5	10.2	8.3	1.9
		Slightly important	6.2	11.9	-5.7	13.9	11.9	2.0
		Moderately important	25.5	29.1	-3.6	30.4	29.1	1.3
		Extremely important	65.5	50.7	14.8	45.5	50.7	-5.2
Importance of reducing stress at work[1]	*	Not at all important	44.8	37.4	7.3	34.9	37.4	-2.5
		Slightly important	23.1	27.5	-4.4	29.1	27.5	1.5
		Moderately important	21.0	19.6	1.4	19.1	19.6	-0.5
		Extremely important	11.2	15.5	-4.3	16.9	15.5	1.5

Importance of handling dependent (child or adult) care[1]		Not at all important	57.3	62.5	-5.1	64.2	62.5	1.8
		Slightly important	15.4	11.9	3.5	10.7	11.9	-1.2
		Moderately important	12.6	13.2	-0.6	13.4	13.2	0.2
		Extremely important	14.7	12.5	2.2	11.7	12.5	-0.8
Importance of having more independence[1]	**	Not at all important	33.3	37.2	-3.9	38.5	37.2	1.4
		Slightly important	26.4	28.2	-1.8	28.8	28.2	0.6
		Moderately important	19.4	20.9	-1.5	21.5	20.9	0.5
		Extremely important	20.8	13.7	7.1	11.2	13.7	-2.5
Importance of spending more time with family[1]		Not at all important	33.1	40.5	-7.4	43.1	40.5	2.6
		Slightly important	19.3	19.8	-0.5	20.0	19.8	0.2
		Moderately important	23.4	19.1	4.4	17.5	19.1	-1.5
		Extremely important	24.1	20.7	3.5	19.5	20.7	-1.2
Importance of saving money[1]	**	Not at all important	34.7	28.8	5.9	26.8	28.8	-2.1
		Slightly important	25.7	23.1	2.6	22.1	23.1	-0.9
		Moderately important	25.0	24.9	0.1	24.8	24.9	0.0
		Extremely important	14.6	23.2	-8.7	26.3	23.2	3.0
Importance of pursuing educational/personal interests[1]		Not at all important	36.6	35.4	1.1	35.0	35.4	-0.4
		Slightly important	22.1	27.7	-5.6	29.7	27.7	2.0
		Moderately important	20.0	19.5	0.5	19.4	19.5	-0.2
		Extremely important	21.4	17.4	4.0	15.9	17.4	-1.4
Importance of helping environment by driving less[1]		Not at all important	17.4	15.0	2.4	14.2	15.0	-0.8
		Slightly important	30.6	27.5	3.1	26.4	27.5	-1.1
		Moderately important	27.1	26.9	0.1	26.9	26.9	0.0
		Extremely important	25.0	30.6	-5.6	32.5	30.6	2.0
Importance of missing social interaction at work[2]	**	Not at all important	15.3	10.2	5.1	8.5	10.2	-1.7
		Slightly important	38.7	33.1	5.6	31.2	33.1	-1.9
		Moderately important	35.0	39.6	-4.6	41.1	39.6	1.6
		Extremely important	10.9	17.1	-6.2	19.2	17.1	2.1
Importance of missing professional interaction at workplace[2]		Not at all important	11.8	9.0	2.8	8.0	9.0	-0.9
		Slightly important	30.9	28.7	2.2	27.9	28.7	-0.8
		Moderately important	40.4	40.1	0.4	39.9	40.1	-0.1
		Extremely important	16.9	22.3	-5.4	24.1	22.3	1.8
Importance of losing career advancement opportunities[2]	**	Not at all important	32.4	23.2	9.2	20.1	23.2	-3.1
		Slightly important	30.9	29.7	1.2	29.3	29.7	-0.4
		Moderately important	25.7	30.3	-4.5	31.8	30.3	1.5
		Extremely important	11.0	16.8	-5.8	18.8	16.8	2.0
Importance of being viewed negatively by	**	Not at all important	38.2	27.7	10.5	24.1	27.7	-3.6

management[2]		Slightly important	34.6	29.6	5.0	27.9	29.6	-1.7
		Moderately important	18.4	27.3	-9.0	30.4	27.3	3.1
		Extremely important	8.8	15.4	-6.5	17.6	15.4	2.2
Importance of main office being better equipped[2]	**	Not at all important	46.7	35.6	11.1	31.8	35.6	-3.8
		Slightly important	32.8	29.4	3.4	28.3	29.4	-1.2
		Moderately important	12.4	24.2	-11.8	28.3	24.2	4.0
		Extremely important	8.0	10.8	-2.8	11.8	10.8	0.9
Importance of getting motivated to work at home[2]	**	Not at all important	70.1	55.4	14.7	50.4	55.4	-5.0
		Slightly important	19.0	25.2	-6.2	27.3	25.2	2.1
		Moderately important	8.0	13.2	-5.2	15.0	13.2	1.8
		Extremely important	2.9	6.2	-3.2	7.3	6.2	1.1
Importance of remembering what to take between home and work[2]	**	Not at all important	65.7	51.9	13.8	47.1	51.9	-4.8
		Slightly important	23.4	29.2	-5.9	31.2	29.2	2.0
		Moderately important	7.3	14.0	-6.7	16.4	14.0	2.3
		Extremely important	3.6	4.9	-1.2	5.3	4.9	0.4
Importance of commute trip being a useful transition between home and work[2]		Not at all important	77.9	70.7	7.2	68.3	70.7	-2.5
		Slightly important	13.2	16.4	-3.2	17.5	16.4	1.1
		Moderately important	7.4	10.3	-2.9	11.3	10.3	1.0
		Extremely important	1.5	2.6	-1.1	3.0	2.6	0.4
Importance of using commute time productively[2]		Not at all important	79.6	78.4	1.2	77.9	78.4	-0.4
		Slightly important	11.7	12.9	-1.2	13.3	12.9	0.4
		Moderately important	6.6	6.0	0.6	5.8	6.0	-0.2
		Extremely important	2.2	2.8	-0.6	3.0	2.8	0.2
Importance of having commute trip to/from work to run errands[2]	*	Not at all important	69.1	63.3	5.8	61.3	63.3	-2.0
		Slightly important	25.0	24.7	0.3	24.6	24.7	-0.1
		Moderately important	5.1	9.7	-4.6	11.3	9.7	1.6
		Extremely important	0.7	2.2	-1.5	2.8	2.2	0.5

[1] Potential advantages of telework.

[2] Potential disadvantages of telework.

Significance levels: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.0001$.

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disadvantage: missing social interaction at work. This finding shows that individuals may be more concerned with the development of their social relations than their professional relations.

The insignificance of the potential advantage of teleworking: spending more time with family defies other findings, which concluded that family time is an essential part of the consideration for telework (e.g., Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997; Bailey and Kurland, 2002; Mokhtarian and Salomon, 1994; Baruch, 2001). Perhaps, these individuals are more concerned with other aspects, such as work-related factors when thinking about telework adoption.

Several of the variables that are commute or transport-related, such as the importance of reducing stress of commuting, helping environment by driving less, commute trip being a useful transition between home and work, using commute time productively, and having commute trip to or from work to run errands were insignificant in the chi-square test. Their insignificances are supported by Doherty and his colleagues (2000) and Bailey and Kurland (2002), who discovered that transport-related factors are not the primary motivations for choosing to telework. Thus, the previous studies by Doherty et al. (2000) and Bailey and Kurland (2002) help explain how those commuting variables could be insignificant when there is a substantial amount of discussion about changing to remote work for the purpose of eliminating the commute trip.

2.4.2.4 Telework and Other Lifestyle Choices

The comparison of teleworkers and non-teleworkers based on telework and other lifestyle choices is shown in Table 11. The choice to buy or lease a more fuel efficient car and the choice to change means of travel to work make up the second set of transport-related factors that are insignificant when tested against telework status (the first set was in the previous section: ability to telework). This trend is also in line with previous studies (e.g., Doherty et al., 2000; Bailey and Kurland, 2002).

2.4.2.5 Views on Various Issues

Table 12 is a comparison of teleworkers and non-teleworkers based on views regarding various issues. The last factor, satisfaction with current workplace arrangement is significant, which agrees with Pinsonneault and Boisvert (2001), but contrasts with Bailey and Kurland (2002). The conflicting evidence regarding job satisfaction calls for further research in this topic.

The view on commute being a hassle and the view on reducing driving to improve transportation and air quality contribute to the third set of transport-related factors that are insignificant in the chi-square test (first set in the ability to telework section and second set in the telework and other lifestyle choices section). This trend provides compelling evidence to support the notion that travel-related aspects are not the primary incentive for telecommuters (Doherty et al., 2000; Bailey and Kurland, 2002).

Furthermore, the view on wanting to spend more time with family and friends is the second insignificant variable related to family time. This pattern is inconsistent with

Table 11 Comparison of teleworkers and non-teleworkers based on telework and other lifestyle choices.

Independent Variable	Sig.	Categories	Telework (%)			Non-telework (%)		
			Obs.	Exp.	Dif.	Obs.	Exp.	Dif.
Choice to buy/lease a more fuel efficient car		Have already done this	28.3	30.2	-2.0	30.9	30.2	0.7
		Have been considering this	34.1	35.8	-1.7	36.4	35.8	0.6
		Have not seriously considered this	37.7	34.0	3.7	32.7	34.0	-1.3
Choice to change work trip departure time to avoid congestion	**	Have already done this	51.1	40.3	10.8	36.5	40.3	-3.8
		Have been considering this	7.8	11.9	-4.1	13.4	11.9	1.5
		Have not seriously considered this	41.1	47.8	-6.7	50.1	47.8	2.3
Choice to change work trip departure time for personal reasons	**	Have already done this	50.7	37.9	12.8	33.5	37.9	-4.4
		Have been considering this	8.0	12.2	-4.2	13.6	12.2	1.4
		Have not seriously considered this	41.3	49.9	-8.6	52.9	49.9	2.9
Choice to change means of travel to work		Have already done this	22.8	19.6	3.2	18.5	19.6	-1.1
		Have been considering this	7.4	9.9	-2.6	10.8	9.9	0.9
		Have not seriously considered this	69.9	70.5	-0.6	70.7	70.5	0.2
Choice to buy home computer for work	***	Have already done this	70.1	47.7	22.4	40.0	47.7	-7.7
		Have been considering this	5.1	11.0	-5.9	13.0	11.0	2.0
		Have not seriously considered this	24.8	41.3	-16.5	47.0	41.3	5.7
Choice to change to new job at same location as before		Have already done this	11.1	12.5	-1.4	13.0	12.5	0.5
		Have been considering this	2.2	5.0	-2.8	6.0	5.0	1.0
		Have not seriously considered this	86.7	82.4	4.2	81.0	82.4	-1.4
Choice to move home closer to current job		Have already done this	10.5	11.8	-1.3	12.3	11.8	0.4
		Have been considering this	14.3	10.5	3.8	9.3	10.5	-1.3
		Have not seriously considered this	75.2	77.6	-2.4	78.4	77.6	0.8
Choice to work part-time instead of full-time		Have already done this	9.8	9.1	0.7	8.8	9.1	-0.2
		Have been considering this	6.8	11.5	-4.8	13.1	11.5	1.6
		Have not seriously considered this	83.5	79.4	4.1	78.0	79.4	-1.4
Choice to work full-time instead of part-time		Have already done this	14.3	12.3	2.0	11.6	12.3	-0.7
		Have been considering this	3.0	2.1	0.9	1.8	2.1	-0.3
		Have not seriously considered this	82.7	85.6	-2.9	86.6	85.6	1.0
Choice to invest in new/existing home-based business		Have already done this	6.0	6.2	-0.2	6.3	6.2	0.1
		Have been considering this	11.2	12.6	-1.4	13.1	12.6	0.5
		Have not seriously considered this	82.8	81.2	1.6	80.7	81.2	-0.5

Significance levels: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.0001$.

Table 12 Comparison of teleworkers and non-teleworkers based on views on various issues.

Independent Variable	Sig.	Categories	Telework (%)			Non-telework (%)		
			Obs.	Exp.	Dif.	Obs.	Exp.	Dif.
View on difficulty of being productive at work		Strongly disagree	28.9	23.3	5.6	21.3	23.3	-2.0
		Disagree	26.8	33.8	-7.1	36.3	33.8	2.5
		Neutral	24.6	23.1	1.5	22.6	23.1	-0.5
		Agree	16.9	17.2	-0.3	17.3	17.2	0.1
		Strongly agree	2.8	2.6	0.2	2.5	2.6	-0.1
View on commute being a hassle		Strongly disagree	24.8	23.3	1.5	22.8	23.3	-0.5
		Disagree	21.3	24.4	-3.2	25.6	24.4	1.1
		Neutral	18.4	23.1	-4.7	24.8	23.1	1.7
		Agree	20.6	17.6	3.0	16.5	17.6	-1.1
		Strongly agree	14.9	11.5	3.4	10.3	11.5	-1.2
View on wanting to spend more time with family and friends		Strongly disagree	2.9	2.6	0.3	2.5	2.6	-0.1
		Disagree	4.3	3.5	0.8	3.3	3.5	-0.3
		Neutral	16.4	21.4	-4.9	23.1	21.4	1.7
		Agree	46.4	46.5	0.0	46.5	46.5	0.0
		Strongly agree	30.0	26.0	4.0	24.6	26.0	-1.4
View on not allowing telework even when job is suitable	**	Strongly disagree	10.1	4.7	5.4	2.8	4.7	-1.9
		Disagree	18.7	13.4	5.3	11.6	13.4	-1.8
		Neutral	25.2	24.8	0.4	24.7	24.8	-0.1
		Agree	40.3	50.4	-10.1	53.9	50.4	3.5
		Strongly agree	5.8	6.7	-1.0	7.1	6.7	0.3
View on reducing driving to improve transportation and air quality		Strongly disagree	4.3	2.8	1.5	2.3	2.8	-0.5
		Disagree	4.3	4.9	-0.5	5.0	4.9	0.2
		Neutral	20.1	20.9	-0.8	21.2	20.9	0.3
		Agree	43.9	43.8	0.0	43.8	43.8	0.0
		Strongly agree	27.3	27.6	-0.3	27.7	27.6	0.1
View on oneself not being very self-disciplined	**	Strongly disagree	50.4	35.8	14.6	30.7	35.8	-5.1
		Disagree	30.9	40.0	-9.1	43.2	40.0	3.2
		Neutral	7.2	14.2	-7.0	16.6	14.2	2.4
		Agree	10.1	8.6	1.5	8.0	8.6	-0.5
		Strongly agree	1.4	1.5	-0.1	1.5	1.5	0.0
View on most teleworkers being part-time	**	Strongly disagree	6.6	4.1	2.5	3.3	4.1	-0.9

workers		Disagree	6.6	11.3	-4.6	12.8	11.3	1.6
		Neutral	39.0	45.0	-6.1	47.1	45.0	2.1
		Agree	41.2	34.9	6.3	32.7	34.9	-2.2
		Strongly agree	6.6	4.7	1.9	4.0	4.7	-0.7
View on being satisfied with one's life	**	Strongly disagree	2.2	1.1	1.0	0.8	1.1	-0.4
		Disagree	3.6	4.5	-0.9	4.8	4.5	0.3
		Neutral	9.4	13.1	-3.7	14.4	13.1	1.3
		Agree	55.4	60.2	-4.8	61.9	60.2	1.7
		Strongly agree	29.5	21.1	8.4	18.2	21.1	-2.9
View on working with a team rather than alone		Strongly disagree	3.6	3.4	0.2	3.3	3.4	-0.1
		Disagree	22.5	18.8	3.7	17.5	18.8	-1.3
		Neutral	34.1	42.0	-8.0	44.8	42.0	2.8
		Agree	31.2	29.3	1.9	28.6	29.3	-0.7
		Strongly agree	8.7	6.6	2.1	5.8	6.6	-0.7
Satisfaction with current workplace arrangement	**	Strongly disagree	2.9	2.8	0.1	2.8	2.8	0.0
		Disagree	7.1	9.7	-2.5	10.6	9.7	0.9
		Neutral	10.7	15.2	-4.5	16.8	15.2	1.6
		Agree	47.1	51.7	-4.5	53.3	51.7	1.6
		Strongly agree	32.1	20.6	11.5	16.6	20.6	-4.0

Significance levels: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.0001$.

other findings (e.g., Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997; Bailey and Kurland, 2002; Mokhtarian and Salomon, 1994; Baruch, 2001).

2.4.2.6 Demographic Information

Lastly, teleworkers and non-teleworkers are compared based on socio-demographic information (see Table 13). The significant findings of one-way commute length and time is in favor with other studies (e.g., Nilles, 1988; Mahmassani et al., 1993; Sullivan et al., 1993; Mokhtarian and Salomon, 1997), with the exception of the study by Mokhtarian (1991), which reported that for current teleworkers, their commute trips have not been linked to the rate of teleworking.

On an interesting note, the presence of children under 6 years is insignificant for telework status. This finding may be striking, but it concurs with the results of previous studies (e.g., Huws et al.,1990; Kinsman, 1987), which explains that couples with young children find it difficult and distracting to work at home.

2.5 Conclusions

This paper explores the factors underlying the decision to adopt telework. The data gathered from the McMaster Telework Survey provided the foundation for accomplishing two objectives: 1) to gain an overall sense of the data by exploring the socio-demographic, telework-related, and social influence characteristics of the sample,

Table 13 Comparison of teleworkers and non-teleworkers based on socio-demographic information.

Independent Variable	Sig.	Categories	Telework (%)			Non-telework (%)		
			Obs.	Exp.	Dif.	Obs.	Exp.	Dif.
Gender	**	Female	68.6	75.1	-6.6	77.5	75.1	2.3
		Male	31.4	24.9	6.6	22.5	24.9	-2.3
Age	***	21 - 30 years of age	3.0	9.7	-6.8	12.1	9.7	2.4
		31 - 40 years of age	17.0	24.9	-7.9	27.7	24.9	2.8
		41 - 50 years of age	38.5	34.8	3.7	33.5	34.8	-1.3
		51 - 60 years of age	27.4	23.7	3.7	22.4	23.7	-1.3
		Over 60 years of age	14.1	6.8	7.3	4.2	6.8	-2.6
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0
Possession of driver's license	*	Yes	93.5	96.0	-2.6	96.9	96.0	0.9
		No	6.5	4.0	2.6	3.1	4.0	-0.9
Household size		Under 2 persons	12.8	14.6	-1.9	15.3	14.6	0.6
		2 - 3 persons	49.6	50.8	-1.2	51.2	50.8	0.4
		4 - 5 persons	34.0	31.4	2.6	30.5	31.4	-0.9
		6 or more persons	3.5	3.1	0.4	3.0	3.1	-0.2
Presence of children under 6 years		None or not applicable	89.6	88.5	1.1	88.1	88.5	-0.4
		Under 2 persons	6.0	7.5	-1.5	8.0	7.5	0.5
		2 - 3 persons	4.4	3.7	0.7	3.5	3.7	-0.2
		4 - 5 persons	0.0	0.3	-0.3	0.4	0.3	0.1
		6 or more persons	0.0	0.0	0.0	0.0	0.0	0.0
Presence of someone needing special care		Yes	8.8	6.1	2.7	5.1	6.1	-0.9
		No	91.2	93.9	-2.7	94.9	93.9	0.9
Licensed drivers per household		0 - 1	61.7	56.5	5.2	54.7	56.5	-1.8
		2 - 3	33.3	38.8	-5.4	40.6	38.8	1.9
		4 - 5	5.0	4.8	0.2	4.7	4.8	-0.1
		6 or more	0.0	0.0	0.0	0.0	0.0	0.0
Household income	**	Less than $15,000	0.0	0.0	0.0	0.0	0.0	0.0
		$15,000 - $34,999	0.0	0.6	-0.6	0.8	0.6	0.2
		$35,000 - $54,999	5.3	11.5	-6.1	13.7	11.5	2.2
		$55,000 - $74,999	9.9	14.5	-4.6	16.2	14.5	1.6
		$75,000 - $94,999	15.3	13.7	1.6	13.2	13.7	-0.6

		$95,000 or more	69.5	59.7	9.8	56.2	59.7	-3.5
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0
Vehicles per driver	**	0 - 1	43.3	40.0	3.2	38.9	40.0	-1.1
		2 - 3	53.9	56.7	-2.8	57.6	56.7	1.0
		4 - 5	1.4	2.9	-1.5	3.4	2.9	0.5
		6 or more	1.4	0.4	1.1	0.0	0.4	-0.4
One-way commute length from home to work	***	Less than 5 km	17.7	22.1	-4.4	23.6	22.1	1.5
		5 - 9 km	14.9	18.1	-3.2	19.2	18.1	1.1
		10 - 19 km	23.4	24.9	-1.5	25.4	24.9	0.5
		20 - 29 km	10.6	14.4	-3.8	15.8	14.4	1.3
		30 - 39 km	4.3	5.5	-1.2	5.9	5.5	0.4
		40 - 49 km	5.0	4.0	0.9	3.7	4.0	-0.3
		50 km or more	24.1	11.0	13.1	6.4	11.0	-4.6
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0
One-way commute time from home to work	**	Less than 10 mins	10.6	12.6	-2.0	38.3	36.3	2.0
		10 - 19 mins	23.4	24.5	-1.1	71.6	70.5	1.1
		20 - 29 mins	20.6	21.4	-0.8	62.4	61.6	0.8
		30 - 39 mins	10.6	16.6	-6.0	53.9	47.9	6.0
		40 mins or more	34.8	24.9	9.9	61.7	71.6	-9.9
		Unknown	0.0	0.0	0.0	0.0	0.0	0.0

Significance levels: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.0001$.

teleworkers' and non-teleworkers' homes and workplace locations, and the observed, and reported commute one-way distances from home to work and 2) to examine the relationship between telework status and several suites of factors affecting telework adoption – namely, job and workplace characteristics, ability to telework, telework and other lifestyle choices, views on various issues, socio-demographic characteristics, and colleague connections. The analyses that were completed to accomplish the objectives indicate that:

1. The descriptive statistics generated on the socio-demographic, telework-related, and colleague connections variables yield some interesting results. For instance, the statistics on the personal characteristics reveal that there is a higher proportion of females than males in the sample and the majority of McMaster employees fall in the age category 41 – 50.

   As for the telework-related characteristics, there is a high number of McMaster employees who have heard of telework before receiving the survey (69.4%). In addition, 25.0% of the sample is currently teleworking and for the individuals who answered no to presently teleworking, the most important reason for not adopting telework is that disadvantages of telework outweigh the advantages of telework.

   The statistical results of the colleague connections variables indicate that the average number of colleagues who are teleworking is 3.0. In addition, on average, employees who have adopted telework speak to 0.3 colleagues about telework before telework was adopted. Furthermore, the results of the two-sample

difference of means t-test and two-sample difference of proportions test for teleworkers and non-teleworkers indicate that teleworkers' and non-teleworkers' verbal communications with colleagues about telework have strong differences in means and proportions. Thus, social interactions at work may play a vital role in individuals' decision to adopt telework.

The mapped locations of the teleworkers' and non-teleworkers' homes and workplaces uncovered that teleworkers tend to live slightly farther from McMaster University's five main workplaces in Hamilton than non-teleworkers.

The matched-pairs *t*-test computed for the comparison of observed and reported commute distances of teleworkers and non-teleworkers reveal that there is no difference between reported and observed commute distances. Also, there is a significant difference between teleworkers' and non-teleworkers' observed commute distances.

2. In the chi-square tests for telework status, the factors, such as job and workplace, ability to telework, telework and other lifestyle choices, views on various issues, and demographic characteristics are statistically significant. In addition, the three sets of transport-related factors (first set in the ability to telework section, second set in the telework and other lifestyle choices section and third set in the views on various issues characteristics) that are insignificant in the chi-square test concur with previous studies, which discovered that transport-related factors are not the primary motivations for choosing to telework (e.g., Doherty et al., 2000; Bailey and Kurland, 2002).

Overall, there are differences in teleworkers' and non-teleworkers' characteristics. Some of the differences lie in the number of individuals currently teleworking at McMaster, the number of their colleagues also teleworking, the locations of their homes in proximity to their workplaces, and their observed commute distances to and from work. Moreover, there are results that are supported by the findings of past studies, while there are results that are not supported. For example, the group of transport-related factors that is insignificant in the chi-square tests is in line with previous studies by Doherty et al. (2000) and Bailey and Kurland (2002). Thus, this trend helps to strengthen the previous findings and the general understanding of factors affecting telework adoption.

Exploring the variables underlying the decision to pursue telework is of importance given the fact that telework is presently viewed as one of the most significant workplace arrangement trends (Nilles, 1994; Handy and Mokhtarian, 1996; Golob, 2000; Bailey and Kurland, 2002; Ellen and Hempstead, 2002; Hardill and Green, 2003; Johnson, 1999, 2003; Haddon and Brynin, 2005). This project contributes to the understanding of the potential determinants in telework adoption, which may help management and employees make the transition from office-based to remote working easier or even possible. Furthermore, the data collected from the McMaster Telework Survey provided empirical data on employees' knowledge, thoughts and feelings regarding telework adoption. Results from this study may also provide groundwork for other studies with similar research interests.

For future studies, when creating a survey to collect data on a very specific topic, such as telework, it would be useful to provide clearer and more detailed explanations or definitions for unfamiliar terms (e.g., telework) to eliminate confusion with survey questions. In addition, to avoid complaints from survey participants that the survey is too long, it would be more practical to decrease the number of questions that are similar or convey the same idea. Questions from the two sections of the survey: telework and other lifestyle choices and views on various issues have no effect on the decision to telework as shown in the results of the probit analysis. Thus, questions from those two sections could be eliminated to decrease the length of the survey or make room for new questions. For instance, more questions could be added to the colleague connections section to learn more about the extent to which social influence affects one's decision to adopt telework. Furthermore, the survey instrument is generic in the sense that it can be readily transferred to other organizations (e.g., private-sector firm and/or government agency with official telework programs) to see if or how social influence impacts the decision to adopt telework in a difference social setting.

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Chapter 3 Investigating the Effects of Social Influence on the Choice to Telework

3.1 Introduction

The effect of social contact on travel behavior is an important topic and has been studied extensively by transportation researchers. In past literatures, some time geographers such as, Hagerstrand (1970), Janelle et al. (1988), Lenntorp (1976) and Pred (1981) have shown that social contact is an important aspect to consider in transportation studies. Other researchers have explored the relationships between gender, socio-demographics, and social organizations within travel behavior research at different levels. There were studies conducted at the aggregate level (for example, Gordon et al, 1989; Hanson and Hanson, 1981a; 1981b; Pas, 1984) and at the individual level (for example, Lu and Pas, 1999).

Some of the previous studies focused on the effect of individual characteristics on social networks (for example, Brass, 1984; Flap et al., 1998; Forret and Dougherty, 2004; Totterdell et al., 2004), individual networking behavior with concentration on people's interactions within the organization (Michael and Yukl, 1993), and the various types of organizational networking behavior (Forret and Dougherty, 2004). Very few studies have touched base on the effects of individuals' connections with others with the exception of studies by Gliebe and Koppelman (2002), Golob and McNally (1997), and Scott and Kanaroglou (2002), which attempted to understand some of the more complex issues, such as intrahousehold interactions in decision-making.

Recent literature in the field of travel behavior and social implications is quite limited with some exceptions, which include a study provided by Axhausen (2006) that focused on the ongoing effects of social networks and travel behavior, as well as studies by Dugundji and Walker (2005) and Páez and Scott (2007) that investigated issues related to social influence and travel behavior. The study of telework adoption is not solely technologically driven, but also it involves social dynamics. Thus, this chapter focuses on the social influences associated with telework adoption.

People are social beings in their everyday activities, especially at the work place. Thus, it is relevant to examine the potential influence that social contact may have on activities at work, such as the decision to adopt telework. This project could help with the understanding as to why or how telework is adopted by organizations and employees or how people can be motivated to adopt telework.

The data gathered from the McMaster Telework Survey provided the basis for accomplishing two objectives: 1) to gain an overall sense of the colleague connections characteristics in the survey and 2) to examine the effects of socio-demographic and social influence characteristics on the choice to telework. Accomplishing these objectives could further the understanding of the potential influences on individuals' decision to pursue telework.

The remainder of this chapter contains the following sections: background studies, methodology, data, results and discussion, and conclusions.

3.2 Background Studies

3.2.1 Social Contact and Social Networks

Social contact occurs every day in many different places: at school, at work, or at the grocery store. Social contact is hard to avoid unless an individual lives in a ghost town with a population of one. Nevertheless, social contact is an important topic as suggested by several time geographers in the discussion of social contact and coupling constraints (for example, Hagerstrand, 1970; Janelle et al, 1988; Lenntorp, 1976; Pred, 1981).

When social contact occurs between people, a social network begins to form. Social network refers to the structural aspects of the bond maintained by individuals and is referred to as a network when communication occurs between the actors at the nodes (Arentze and Timmermans, 2008). Likewise, social network analysis is defined as the study of social formation and the effects it has on important aspects in social and economic life (Tindall and Wellman 2001). Social network analysis is of importance because it helps with the understanding of how social networks facilitate and restrict behaviors that may affect individuals' decision-making. In addition, social events are hard to understand by simply analyzing individual attributes (Carrasco and Miller, 2006). Studying social networks as a whole could lead to the discovery of social formation aspects that only result from the interaction between individuals. Thus, focusing on the network as a whole, rather than the aggregate of individual behavior is a more suitable approach for understanding social phenomena.

There is evidence showing that the connection between social interactions and amount of travel exist. Harvey and Taylor (2000) conducted a study using 1992 Canadian time-use data and discovered that employees who work from home spend less time with others. Their results also show that these employees spend as little as 17% of their time (when awake) with others as compared to 50% for individuals in the conventional workplace, such as the office. Harvey and Taylor (2000) also found that people who have very little social interactions with others tend to do more traveling (in vehicle). These results suggest that this work arrangement may not reduce travel for everyone, but just alter the purpose of the travel (Arentze and Timmermans, 2008). Nevertheless, people are social beings and their desire to participate in social activities can induce travel. The notion that travel is motivated by the need for belongingness in social activities has been highlighted by transportation analysts (e.g., McNally, 2000; Salomon, 1985), and time geographers (e.g., Lenntorp, 1976).

3.2.2 Social Influence and Decision-making

Within a social network, there are social influences amongst individuals. In general, social influence is described as the incident when an actor adjusts his/her behavior, attitude, and/or belief to the behaviors, attitudes, or beliefs of other actors in his/her social network (Leenders, 2002). In network analysis research, social influence is referred to as "a special instance of causality, when an actor's responses (that is, attitudes or behavior) are modified by those of other actors" (Páez and Scott, 2007).

Within the topic of social influence, Marsden and Friedkin (1994) explained how social power could be used to impose influence on individuals, especially when the position in power is capable of intimidating or rewarding others. This type of link between individuals would occur in a hierarchical system. Another process with significance to social influence is majority effects. Moscovici (1985) illustrates that majority effects can lead to normalization in situations where the majority influences the minority.

According to Leenders (2002), nearly all theories of social influence can be explained by the concept of social reference. Social reference is described as the outcomes of comparison and communication procedures that occur simutaneously or independently (Leenders, 2002). With regards to comparison, structure is when actors use individuals, who share similarities with them, as their frame of reference (e.g., workplace colleagues). For communication, the process consists of actors using individuals with whom they are linked to as their frame of reference (Leenders, 2002).

Social influence at the workplace could affect one's decision-making in many situations. For instance, Martinez-Sanchez et al. (2008) conducted a survey on 156 Spanish firms and found that employees' level of access to human resources' social benefits and commitment routines were positively associated with the amount of telework that was adopted. In addition, their findings provide evidence that constructing a social atmosphere can lead to greater levels of trust between the employees and individuals with authority (Martinez-Sanchez et al., 2008).

Social influence can also affect decision-making regarding travel activities. Through interactions in social networks, individuals can share knowledge regarding activity-travel choice alternatives and one's preferences for those alternatives (Arentze and Timmermans, 2008). Social influence can lead to the exchange of information and adjustment of one's opinion or preferences on certain issues. This type of influence could also been seen in the workplace amongst colleagues. According to Páez and Scott (2007), telework adoption may increase as workers see more of their colleagues in their social network adopting telework. On the contrary, people may be discouraged to adopt this workplace arrangement if they see very few colleagues adopting it. People could interact with one another through communication and learn if adopters had a positive or negative experience. Thus, social influence could be viewed as a social constraint or facilitator based on the direction of the effect from the influence and the outcome after the effect (Mokhtarian and Salomon, 1994).

The social setting in which individuals are interacting in can also influence decision-making. Sometimes actors come across new situations where there is no information available to help them make a decision (Páez and Scott, 2007). This is when information from other actors or the behavior of other actors could be a useful or the only source of information that is available to the decision-maker (Páez and Scott, 2007).

On an interesting note, social networks can be dynamic, which means that new social links are being created, while existing social links are being diminished (Arentze and Timmermans, 2008). Not only are social networks dynamic, but also, they have social consequences (Akerlof, 1997). Individuals' decisions and choices will not only

affect one's life, but also affect the way he/she associates with other people in his/her social network.

3.3 Methodology

3.3.1 Specification of Influence

In network analysis research, social influence is considered a causality when an individual's reaction (e.g., attitudes and behavior) is shaped by the actions of others. According to Leenders (2002), most theories of social influence can be explained by the concept of social reference. Social reference is considered as the outcomes of comparison and communication procedures that occur simultaneously or independently (Leenders, 2002). Comparison exemplifies structure when actors use individuals, who share similarities with them, as their frame of references (for example, colleagues at work). The total colleagues in an individual's social network can be categorized by the type of colleague:

$$A_n = \sum_{q=1}^{Q} A_q^n , \quad (1)$$

where q is a type of colleague in individual n's social network. A general formulation of social structure, including type of colleague with absolute weight, is shown below:

$$A_q^n = \sum_{m=1}^{M} w_{nm}\, y_q^{nm} , \quad (2)$$

where w_{nm} is a 'weight' that distinguishes the nature of the relationship between individuals n and m. For instance, the relationship could involve whether they know each

other. The formulation of social structure also contains a parameter to estimate the type of colleague:

$$y_q^{nm} = \begin{cases} 1, & \text{if individual } m \text{ is one of individual } n\text{'s colleagues of type } q, \\ 0, & \text{otherwise,} \end{cases} \quad (3)$$

where the different types of colleagues in this research include: 1) colleagues who telework and whose advice was sought from about work-related and other issues, 2) colleagues who telework and whose advice was not sought from about work-related and other issues, 3) colleagues who do not telework and whose advice was sought from about work-related and other issues, and 4) colleagues who do not telework and whose advice was not sought from about work-related and other issues. It is also important to identify and weight the members of the social reference framework. Thus, to weight the colleagues of the social reference framework, the vector, w_{nm} is defined as:

$$w_{nm} = \begin{cases} 1, & \text{if individual } m \text{ is one of individual } n\text{'s colleagues,} \\ 0, & \text{otherwise,} \end{cases} , \quad (4)$$

where a colleague is a contact who is directly significant to the individual within the context of the analytical process. The weight in equation (4) is a measure of absolute influence. Likewise, the relative influence, as derived from equation (4) can be written as:

$$w_{nm}^r = \frac{w_{nm}}{\sum_{m=1}^{M} w_{nm}} . \quad (5)$$

This relative weight takes into account the number of colleagues that an individual has in his/her social network. Therefore, this weight would imply that every individual receives equal amount of influence, but in different proportions from diverse sources.

3.3.2 Bivariate Probit Model

The hypothesis is that an individual, characterized by socio-demographic and social influence characteristics, seeks to maximize utility through the choice of telework status (to telework or not to telework). A bivariate probit model is developed to model the choice of telework status for employees at McMaster University. In this analysis, the strength of the model would be the fact that the model accounts for two types of characteristics of the individual: socio-demographic and social influence. The importance of incorporating the structure of social influence lies in the fact that an individual's behavior will not solely depend on his/her own level of consumption, but also on other agents in the system. To our knowledge, this is one of the first attempts to incorporate both socio-demographic and social influence factors in a modeling framework. In addition, this is the first attempt to extend Páez and Scott's simulation example of the decision to telecommute (cf. Páez and Scott, 2007) with empirical data and analysis. In this modeling framework, the utility specification considers a utility maximizing individual n, who chooses a telework status j based on socio-demographic characteristics X and social influence characteristics A. The utility function (U_{nj}) is written as:

$$U_{ni} = \sum_{k=1}^{K} \beta_k X_{ki}^n + \sum_{q=1}^{Q} \gamma_q A_{qi}^n + \varepsilon_{ni}, \forall\, i \text{ in } J_n\,, \tag{6}$$

where the β is the socio-demographic coefficients to be estimated, γ is the social influence coefficients to be estimated, and ε_n is a randomly distributed error term. J_n is the choice set in which individual n obtains the utility from alternative i. The individual

socio-demographic characteristics are represented by *k*. When individual *n* chooses telework status *i*, the utility function is represented as:

$$U_{ni} > U_{nj},\ \forall j, j \neq i\ . \tag{7}$$

For simplicity, the utility function specified in (6) can be rewritten as:

$$U_{ni} = V_{kqi}^{n} + \varepsilon_{ni}\ , \forall\ i \text{ in } J_n\ , \tag{8}$$

where V_{kqi}^{n} is the systematic component of utility that can be observed and measured for the analysis. The equation for the bivariate probit model can now be written as:

$$y_{ni}^{*} = \beta_k X_{ki}^{n} + \gamma_q A_{qi}^{n} + \varepsilon_{ni}\ , \tag{9}$$

where y_{ni}^{*} is the propensity for individual *n* to adopt telework. The probability that individual *n* chooses a telework status *i* is given as:

$$P_{ni} = Prob\left(\beta_k X_{ki}^{n} + \gamma_q A_{qi}^{n} + \varepsilon_{ni} > \beta_k X_{kj}^{n} + \gamma_q A_{qj}^{n} + \varepsilon_{nj}, \forall\ j \text{ in } J_n, j \neq i\right), \tag{10}$$

which is the bivariate probit model. The parameters (β and γ) are obtained by maximizing the log-likelihood function:

$$L^{*} = \sum_{n=1}^{N} \sum_{j=1}^{J} D_{ij} \log \mathrm{P}_n\ , \tag{11}$$

where

$$D_{ij} = \begin{cases} 1, & \text{if individual n chooses telework status j,} \\ 0, & \text{otherwise.} \end{cases} \tag{12}$$

In the probit analysis, the rho-squared value (ρ^2) is computed as a measure of the goodness-of-fit of the model. Thus, the ρ^2 is computed as follows:

$$\rho^2 = 1 - \frac{L^*(\beta)}{L^*(0)}, \tag{13}$$

where $L^*(\beta)$ is the value of the log-likelihood function at its maximum (model with independent variables) and $L^*(0)$ is the value of the log-likelihood function when all the parameters are zero.

3.4 Data

3.4.1 Survey Instrument

Data for this research were obtained from the McMaster Telework Survey, which was a self-administered online survey and took approximately 20 to 30 minutes to complete. The survey was sent by email to McMaster university faculty members, management groups, and staff members. Of the 4,000 surveys that were sent out, 936 were completed, which yielded an effective 23.4% response rate.

Furthermore, only employees with a registered McMaster University email address could participate in the survey. The reason for the restriction is that one of the sections of the survey was prepared in advance with a list of eligible survey participants, who were extracted from the McMaster University Faculty and Staff Directory. This preparation allowed participants to select their colleagues in their social networks for the colleague connections part of the survey. Thus, these data provided social influence variables for analysis in this research.

The McMaster Telework Survey covered a wide range of questions and consisted of 7 distinct sections: 1) telework knowledge and experience, 2) job and workplace

characteristics, 3) colleague connections, 4) ability to telework, 5) telework and other lifestyle choices, 6) views on various issues, and 7) demographic information.

In the first section, telework knowledge and experience, there were questions regarding employees' previous experience with telework. The second theme in the survey was job and workplace characteristics. Respondents had the opportunity to provide information regarding the nature of their job, such as types of tasks done at work. Colleague connections was the third section of the survey, which is discussed in further detail in the following section. Ability to telework was the fourth part of the survey that examined employees' ability to adopt flexible workplace arrangements. In addition, there were questions inquiring opinions on the importance of potential advantages and disadvantages of telework. The following section, telework and other lifestyle choices collected information on employees' feelings about other possible choices that helped put their feelings about telecommunications into the proper context. Views on various issues was the second last part of the McMaster Telework Survey, which asked about views on a variety of issues directly and/or indirectly related to telework. The last section gathered personal and household information, as well as some more information related to individuals' commute to and from work.

Colleague connections was the third section of the survey, which was unique from other telework surveys in the sense that it captured interactions among colleagues at work. The colleague connections measured the extent to which social interactions influence an individual's decision to adopt telework. This connection was captured when employees indicated which colleague(s) they were associated with and provided some

additional information about these colleagues in the survey. For example, employees could indicate their colleagues' telework status, the colleagues whose advice about work-related issues were sought from, and/or the colleagues who were spoken to before or after telework was adopted. There were 585 out of 936 completed surveys with the colleague connections questions answered. Thus, these questions provided the basis for studying the effects of social influences at work on the decision to adopt telework.

3.4.2 Creation of Influence Variables for Modeling

The dependent variable used for the empirical analysis was telework status (currently teleworking or not) (see Table 14). The independent variables were selected from several sections of the McMaster Telework Survey: job and workplace characteristics, ability to telework, telework and other lifestyle choices, views on various issues, demographic information, and colleague connections. All of the pre-selected independent variables from the survey were initially input into the bivariate probit model. However, only the variables with statistically significant coefficients were kept in the final models (see Table 14). In addition, only the data from the employees who indicated their telework status and answered the questions from the colleague connections section were included in the probit analysis, which resulted in a total of 477 employees.

The colleague connections section provided several social influence variables (both absolute and relative influence variables), which were used as independent

Table 14 Variables used in the empirical analysis of teleworker versus non-teleworker.

Variable	Definition
Dependent variable	
Telework status	0 if person teleworks; 1 otherwise
Independent variables	
Job and workplace characteristics	
Employee type	
Faculty	Reference category
Staff	1 if person is a staff member; 0 otherwise
Number of hours spent on work done in a specific location	
0 hours	Reference category
More than 24 hours	1 if number of hours spent on work done in a specific location is more than 24 hours; 0 otherwise
Could create office space at home for teleworking	
Missing response	Reference category
Yes, an entire room	1 if could set aside an entire room at home if the opportunity arose to work from home; 0 otherwise
Awareness of telework	
Aware of household members also teleworking	1 if person is aware of household members also teleworking; 0 otherwise
Aware of neighbors also teleworking	1 if person is aware of neighbors also teleworking; 0 otherwise
Aware of friends also teleworking	1 if person is aware of friends also teleworking; 0 otherwise
Ability to telework characteristics	
Amount of time supervisor would allow for teleworking	
Not at all	Reference category
1 - 2 days a week	1 if person has about 1 - 2 days a week that supervisor would allow for teleworking; 0 otherwise
3 - 4 days a week	1 if person has about 3 - 4 days a week that supervisor would allow for teleworking; 0 otherwise
5 days a week	1 if person has about 5 days a week that supervisor would allow for teleworking; 0 otherwise

Importance of having more time for oneself[1]	
Not at all important	Reference category
Slightly important	1 if importance of having more time for oneself is slightly important; 0 otherwise
Moderately important	1 if importance of having more time for oneself is moderately important; 0 otherwise
Extremely important	1 if importance of reducing the stress of commuting is extremely important; 0 otherwise
Importance of getting more work done[1]	
Not at all important	Reference category
Extremely important	1 if person ranked importance of getting more work done as extremely important; 0 otherwise
Importance of saving money[1]	
Not at all important	Reference category
Extremely important	1 if person ranked importance of saving money as extremely important; 0 otherwise
Importance of being viewed negatively by management[2]	
Not at all important	Reference category
Extremely important	1 if importance of risking the chance of being viewed negatively by management is extremely important; 0 otherwise
Importance of main office being better equipped[2]	
Not at all important	Reference category
Extremely important	1 if importance of having a main office that is nicer/better equipped is extremely important; 0 otherwise
Socio-demographic characteristics	
Possession of a driver's license	
No	Reference category
Yes	1 if person has a driver's license; 0 otherwise

One-way commute length from home to work	
Less than 5 km	Reference category
50 km or more	1 if distance from home to primary work place (one way) is 50 km or more; 0 otherwise
Colleague Connections characteristics	
Size of social network	
Number of colleagues	Number of colleagues in social network
Colleagues' telework status and sought advice from colleagues	
Number of colleagues who telework and whose advice was sought from about work-related and other issues	Number of colleagues who telework and whose advice was sought from about work-related and other issues
Number of colleagues who telework and whose advice was not sought from about work-related and other issues	Number of colleagues who telework and whose advice was not sought from about work-related and other issues
Number of colleagues who do not telework and whose advice was sought from about work-related and other issues	Number of colleagues who do not telework and whose advice was sought from about work-related and other issues
Number of colleagues who do not telework and whose advice was not sought from about work-related and other issues	Number of colleagues who do not telework and whose advice was not sought from about work-related and other issues
Proportion of colleagues' telework status and sought advice from colleagues	
Proportion of colleagues who telework and whose advice was sought from about work-related and other issues	Proportion of colleagues who telework and whose advice was sought from about work-related and other issues
Proportion of colleagues who telework and whose advice was not sought from about work-related and other issues	Proportion of colleagues who telework and whose advice was not sought from about work-related and other issues
Proportion of colleagues who do not telework and whose advice was sought from about work-related and other issues	Proportion of colleagues who do not telework and whose advice was sought from about work-related and other issues
Proportion of colleagues who do not telework and whose advice was not sought from about work-related and other issues	Proportion of colleagues who do not telework and whose advice was not sought from about work-related and other issues

[1] Potential advantages of telework.

[2] Potential disadvantages of telework.

variables for the empirical analysis (see Table 14 and Table 15). However, only the social influence variables with statistically significant coefficients in the final models are shown in Table 14, while Table 15 includes all of the variables from the colleague connections section (including the variables that were excluded from the probit analysis). Examples of absolute influence variables include: colleagues' telework status, spoke to colleague about telework before and after telework was adopted (which only applies to employees who have adopted telework), sought advice from colleagues about work-related and other issues, size of social network, and combinations of colleagues' telework status, and sought advice from colleagues, all of which were in the form of counts (e.g., number of colleagues who telework). The combined variables were created by comparing two original variables and checking if they fit the criteria for the new combined variable. An example of a combined variable would be number of colleagues who telework and whose advice was sought from about work-related and other issues.

As for the relative influence variables, they consisted of proportions of the absolute influence variables. They were created by taking the absolute variable and dividing it by the total number of colleagues in the social network. For example, proportion of colleagues' telework status was created by dividing the number of colleagues who telework by the total number of colleagues in the social network.

Table 15 Description of colleague connections characteristics (social influence variables) (N = 477).

Variable	Minimum	Maximum	Mean	Standard Deviation
Absolute influence variables				
Colleagues' telework status				
Number of colleagues who telework	0	57	3.02	5.72
Number of colleagues who do not telework	0	174	7.78	13.35
Number of colleagues whose telework status is unknown	0	330	11.16	24.64
Spoke to colleagues about telework*				
Number of colleagues who were spoken to about telework before telework was adopted*	0	10	0.32	1.08
Number of colleagues who were spoken to about telework after telework was adopted*	0	37	0.56	2.67
Number of colleagues who were not spoken to about telework*	0	502	20.53	33.02
Number of colleagues whose conversations with regarding telework were not remembered*	0	51	0.47	3.46
Sought advice from colleagues				
Number of colleagues whose advice was sought from about work-related and other issues	0	329	12.27	20.96
Number of colleagues whose advice was not sought from about work-related and other issues	0	201	9.27	20.18
Size of social network				
Number of colleagues	1	562	22.53	36.18
Colleagues' telework status and advice sought				
Number of colleagues who telework and whose advice was sought from about work-related and other issues	0	25	1.80	3.40
Number of colleagues who telework and whose advice was not sought from about work-related and other issues	0	37	1.22	3.13

Number of colleagues who do not telework and whose advice was sought from about work-related and other issues	0	102	4.70	8.05
Number of colleagues who do not telework and whose advice was not sought from about work-related and other issues	0	100	2.91	7.67
Relative influence variables				
Proportion of colleagues' telework status and advice sought				
Proportion of colleagues who telework	0	1	0.18	0.26
Proportion of colleagues who were spoken to about telework before telework was adopted*	0	1	0.04	0.13
Proportion of colleagues who were spoken to about telework after telework was adopted*	0	1	0.03	0.11
Proportion of colleagues whose advice was sought from about work-related and other issues	0	1	0.63	0.35
Proportion of colleagues who telework and whose advice was sought from about work-related and other issues	0	1	0.13	0.22
Proportion of colleagues who telework and whose advice was not sought from about work-related and other issues	0	1	0.06	0.13
Proportion of colleagues who do not telework and whose advice was sought from about work-related and other issues	0	1	0.29	0.33
Proportion of colleagues who do not telework and whose advice was not sought from about work-related and other issues	0	1	0.13	0.22

*Variable only pertains to telework adopters

3.4.3 Description of Social Influence Variables

Table 15 describes the descriptive statistics for the 477 individuals who indicated their telework status and answered the questions from the colleague connections section of the survey. With respect to the first absolute influence variable, colleagues' telework status, individuals have on average 3.02 colleagues who telework. Each teleworking employee spoke to a mean number of 0.32 colleague about telework before telework was adopted and a mean number of 0.56 colleague about telework after telework was adopted. On average, individuals sought advice from 12.27 colleagues about work-related and other issues. In addition, the number of colleagues that each employee has ranges from 1 to 562. The average number of colleagues that each individual has is 22.53. Overall, the relative influence variables exhibit much lower mean values than the absolute influence variables. For instance, the averages for the relative influence variables range from 0.03 to 0.63, while the averages for the absolute influence variables range from 0.32 to 22.53.

3.5 Results

3.5.1 Model Specification and goodness of fit

The three final joint bivariate probit models presented in Table 16 were derived from the computation of eight independent models and several combined models. The first single model contained only the job and workplace characteristics. Ability to telework characteristics were the basis on which the second independent model was built. The third and fourth models consisted of variables from telework and other lifestyle

Table 16 Estimation results for the teleworker versus non-teleworker bivariate probit model with social influence.

Variable	Model 1 Absolute influence		Model 2 Absolute influences		Model 3 Relative influences	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-1.44	-4.60	-0.99	-3.64	-0.86	-3.12
Job and workplace characteristics						
Employment type						
Reference variable: Faculty						
Staff	-0.45	-2.02	-0.46	-2.18	-0.50	-2.35
Number of hours spent on work done in a specific location						
Reference variable: 0 hours						
More than 24 hours	0.59	1.99				
Could create office space at home for teleworking						
Reference variable: Missing response						
Yes, an entire room	1.03	2.87				
Awareness of telework						
Aware of household members also teleworking	0.74	2.34			0.67	
Aware of neighbors also teleworking	1.20	3.19	1.14	3.01	1.04	2.79
Aware of friends also teleworking	1.39	6.31	1.47	6.78	1.31	5.95
Ability to telework characteristics						
Amount of time supervisor would allow for teleworking						
Reference variable: Not at all						
1 - 2 days a week	0.93	4.57	0.92	4.67	0.87	4.36
3 - 4 days a week	1.15	3.46	0.96	2.94	0.94	2.84
5 days a week	1.73	2.46	1.44	2.22	1.42	2.15
Importance of having more time for oneself[1]						
Reference variable: Not at all important						
Slightly important	0.64	2.42			0.68	2.58
Moderately important	0.72	2.57			0.68	2.44
Extremely important	0.63	2.15			0.65	2.20
Importance of getting more work done[1]						

Reference variable: Not at all important						
Extremely important	0.65	3.14	0.64	3.23	0.59	2.92
Importance of saving money[1]						
Reference variable: Not at all important						
Extremely important	-0.95	-3.32	-0.89	-3.19	-0.93	-3.27
Importance of being viewed negatively by management[2]						
Reference variable: Not at all important						
Moderately important	-0.65	-2.54	-0.76	-2.94	-0.72	-2.76
Importance of main office being better equipped[2]						
Reference variable: Not at all important						
Moderately important	-0.67	-2.60	-0.57	-2.33	-0.75	-2.92
Socio-demographic characteristics						
Possession of a driver's license						
Reference variable: No						
Yes	-0.64	-2.66	-0.55	-2.42	-0.68	-2.88
One-way commute length from home to work						
Reference variable: Less than 5 km						
50 km or more	1.08	3.07	1.27	3.82	1.11	3.08
Colleague connections characteristics						
Size of social network						
Number of colleagues						
Colleagues' telework status and advice sought						
Number of colleagues who telework and whose advice was sought from about work-related and other issues			0.08	2.96		
Number of colleagues who telework and whose advice was not sought from about work-related and other issues			0.09	2.46		
Number of colleagues who do not telework and whose advice was sought from about work-related and other issues			-0.02	-2.37		

Number of colleagues who do not telework and whose advice was not sought from about work-related and other issues				
Proportion of colleagues' telework status and advice sought				
Proportion of colleagues who telework and whose advice was sought from about work-related and other issues				
Proportion of colleagues who telework and whose advice was not sought from about work-related and other issues				
Proportion of colleagues who do not telework and whose advice was sought from about work-related and other issues			-1.10	-3.28
Proportion of colleagues who do not telework and whose advice was not sought from about work-related and other issues				
Summary statistics				
N	477	477	477	
$L^*(0)$	-263.46	-263.46	-263.46	
$L^*(\beta)$	-127.53	-128.37	-127.59	
ρ^2	0.52	0.51	0.52	

[1] Potential advantages of telework.

[2] Potential disadvantages of telework.

choices and views on various issues characteristics, however, neither of these two models produced any significant coefficients. The next model served to estimate the fifth independent model, which contained socio-demographic and work-related characteristics. Each of the last three single models consisted of a different set of social influence variables (three sets in total) from the colleague connections section. All the final independent models contained only the statistically significant variables.

Once the eight independent models were generated, joint models were generated by combining the single models. The process began with the grouping of variables from the first independent model to the second one. The first final pooled model contained only significant coefficients. The process continued with the addition of the variables from the next consecutive single model to the first final joint model, as well as the evaluation of the significance of the coefficients. This model specification process repeated until all the variables of the first six independent models were combined. As a result of the combining procedure, there was one final joint model, which was the final combined model with only the socio-demographic and work-related characteristics. The last three single models (each with different types of social influence variables) were not joined the same way as the other single models. Instead, the influence variables of the last three independent models were used as the basis to form the final joint models of the probit analysis. The three final combined models are defined as:

1. Final model 1: socio-demographic and work-related characteristics and one absolute influence variable

2. Final model 2: socio-demographic and work-related characteristics and four absolute influence variables
3. Final model 3: socio-demographic and work-related characteristics and four relative influence variables

The first final joint bivariate probit model contained one absolute influence variable, which was size of social network. The second model contained four absolute influence variables: 1) colleagues who telework and whose advice was sought from about work-related and other issues, 2) colleagues who telework and whose advice was not sought from about work-related and other issues, 3) colleagues who do not telework and whose advice was sought from about work-related and other issues, and 4) colleagues who do not telework and whose advice was not sought from about work-related and other issues. The last model contained four relative influence variables, which are proportions of the absolute influence variables that were used in the second final joint bivariate probit model. The outcome of this multi-step model specification process is the three models shown in Table 16.

The ρ^2 for the three "best" models indicate very reasonable goodness of fit (ρ_1^2= 0.52, ρ_2^2 = 0.51, ρ_3^2 = 0.52, respectively). The first and third models have the best goodness of fit for the decision to adopt telework. Perhaps, incorporating the number of colleagues that each employee has into the analysis helps to provide a better goodness fit for estimating the effects of social influence on the choice to telework.

3.5.2 Discussion of the final models

The final joint models contain significant coefficients belonging to job and workplace, ability to telework, socio-demographic, and colleague connections characteristics. There are no significant variables from the telework and other lifestyle choices and views on various issues sections of the survey. The following sections summarize the findings from the probit analysis of the three final combined models.

Job and workplace characteristics. For the employee type, staff members are less likely to adopt telework in Models 2 and 3 than Model 1. The significant result of employee type in the model accords with the studies by the Mannering and Mokhtarian (1995) and Mokhtarian and Salomon (1996b; 1997). Those previous studies also suggested that work-related factors are most important when it comes to the decision to adopt telework.

In Model 1, employees who spent more than 24 hours on work in a specific location and employees who could set aside an entire room at home as a home office for teleworking are more likely to adopt telework. The significance of employees who could set aside an entire room at home as a home office for teleworking in the model coincides with previous studies on the topic of the availability of physical space for a home office and telework adoption (for example, Yen, 2000; Sullivan and Lewis, 1998; Baruch, 2000).

For Models 1, 2, and 3, employees who were aware of friends also teleworking have the greatest propensity to telework when compared to awareness of household members and neighbors also teleworking. The result of awareness of others also

teleworking affecting telework adoption illustrates that social influence has an impact on an individual's decision to telework. The potential impacts that the different types of social influence could have on telework adoption are discussed in further detail with colleague connections characteristics.

Ability to telework characteristics. The model results suggest that employees' ability to telework greatly impact telework adoption. Specifically, the coefficients for employees who had 1 - 2 days a week, 3 - 4 days a week, and 5 days a week for amount of time that their supervisor would allow for teleworking in all three models are positive and significant, indicating a greater propensity for teleworking. Also, as the amount of time that the supervisor would allow for teleworking increases, the propensity for workers to telework also increases. The outcome of willingness of management to consent to telework affecting the decision to adopt telework is in line with several studies (e.g., Bailey and Kurland, 2002; Huws et al., 1990; Mokhtarian et al., 1998; Olson and Primps, 1984; Tomaskovic-Devey and Risman, 1993).

Furthermore, employees in Models 1 and 3, who ranked importance of having more time for oneself as slightly, moderately, and extremely important are more likely to adopt telework. For all three models, the coefficients for employees who ranked importance of getting more work done as extremely important are positive and significant, indicating a greater propensity for teleworking. On an interesting note, when relative influence variables are used in Model 3, the propensity to telework decreases.

For all three models, the coefficients for employees who ranked importance of saving money, being viewed negatively by management, and having main office being

better equipped than home office as extremely important are negative and significant, indicating a decreased propensity for teleworking.

Interestingly, a large number of the significant coefficients pertains to work-related variables (e.g., time spent on work done in a specific location, ability to create office space at home, wanting to get more work done, being viewed negatively by management, and having a well-equipped office), which is consistent with other studies that have suggested that work-related aspects are driving forces in pursing telework (e.g., Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997).

Socio-demographic characteristics. Individuals who possess a driver's license are unlikely to telework despite the types of social influence variables used in the three models. Perhaps, individuals with a driver license are also more likely to own a private vehicle and would want to maximize their vehicle's utility by driving to work. On the contrary, individuals who do not possess a driver's license, nor a private vehicle, may be more open to working from home as they may not view public transportation as an attractive mode of transportation.

Model 2 exhibits a greater propensity to adopt telework than Models 1 and 3 when employees' one-way commute length from home to work is 50 kilometers or more. The significant impact of one-way commute length on telework adoption is in favor with other studies in the literature (e.g., Nilles, 1988; Mahmassani et al., 1993; Sullivan et al., 1993; Mokhtarian and Salomon, 1997), with the exception of the study by Mokhtarian (1991), which reported that for the current teleworkers, their commute trips have not been linked to the rate of telework adoption.

Colleague connections characteristics. In Model 1, the absolute influence variable, number of colleagues in social network was insignificant, thus, this social influence variable does not affect the propensity to adopt telework.

In Model 2, for employees with colleagues who telework and whose advice was sought from about work-related and other issues and colleagues who telework and whose advice was not sought from about work-related and other issues, they have a greater propensity to telework. In addition, employees with colleagues who do not telework and whose advice was sought from about work-related and other issues are less likely to adopt telework. Results from the third model illustrate that employees' proportion of colleagues who do not telework and whose advice was sought from about work-related and other issues exhibit a lower probability to telework.

Overall, none of the significant coefficients belonged to commuting, or transportation-related characteristics. Their insignificance are supported by Doherty and his colleagues (2000) and Bailey and Kurland (2002), who discovered that transport-related factors are not the primary motivations for choosing to telework. Thus, the previous studies by Doherty et al. (2000) and Bailey and Kurland (2002) help to explain how those commuting variables could be insignificant when there is a substantial amount of discussion about changing to remote work for the purpose of eliminating the commute trip.

3.6 Conclusions

This paper examines the impacts of socio-demographic, work-related and social influence determinants on the decision to adopt telework. The data gathered from the McMaster Telework Survey provided the groundwork for accomplishing two objectives: 1) to examine the social influence characteristics of the sample and 2) to model the socio-demographic and social influence factors on the decision to telework. The analyses conducted to accomplish the objectives indicate that:

1. The average and the range for the number of colleagues that each employee has is quite large (average: 22.53 and range: 1 to 562) compared to the average number of colleagues who telework (3.02). Overall, the averages of the relative influence variables are much lower than the averages of the absolute influence variables. This difference occurs because the relative influence variables control for the number of colleagues that each individual has.
2. The bivariate probit analysis reveals that the ρ^2 for the three joint models indicate very reasonable goodness of fit (ρ_1^2= 0.52, ρ_2^2 = 0.51, ρ_3^2 = 0.52). However, the first and third final models have the best goodness of fit for the decision to telework.

   Overall, the probit analysis demonstrates that job and workplace, ability to telework, socio-demographic, and colleague connections characteristics are significant in predicting an individual's propensity to adopt telework. Interestingly, work-related characteristics (e.g., time spent on work done in a specific location, ability to create office space at home, and wanting to get more

work done) are the predominant factors in predicting telework adoption, which is consistent with other studies that have suggested that work-related aspects are the main driving forces in the decision to pursue telework (e.g., Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1996b; 1997). On the other hand, none of the commute or transport-related characteristics are significant in the probit analysis, which concur with the studies by Doherty and his colleagues (2000) and Bailey and Kurland (2002), which discovered that transport-related factors are not the primary motivations for the choice to telework.

Overall, the descriptive analysis of the social influence variables provides a general overview of the data used in the empirical analysis. Significant differences exist between the number of colleagues who telework and whose advice was sought from, as well as between the absolute and relative influence variables. Interestingly, the probit analysis reveals that the predominant factors were work-related characteristics, while none of the commute or transport-related characteristics were significant. Overall, all three joint bivariate probit models provide very reasonable goodness of fit for the decision to telework.

Investigating the impacts of socio-demographic, work-related, and social influence characteristics underlying the decision to pursue telework is important given the fact that telework is presently recognized as one of the most significant workplace arrangement trends (Nilles, 1994; Handy and Mokhtarian, 1996; Golob, 2000; Bailey and Kurland, 2002; Ellen and Hempstead, 2002; Hardill and Green, 2003; Johnson, 1999, 2003; Haddon and Brynin, 2005). Thus, this research contributes to the understanding of

the possible social implications involved in telework adoption, which may help management and employees make the transition from office-based to remote working easier and more feasible.

People are social beings in their everyday activities, especially at their work places. Thus, it is almost impossible to deny the fact that many key decisions made by individuals are influenced by their interactions with their colleagues at work. With the trend of working away from the workplace growing, it has become more crucial to further our understanding of the effects of social influences on important decisions, such as the choice to adopt telework.

Several factors are found to be significant in the probit analysis and are influences on the decision to telework, which include socio-demographic, work-related and social influence characteristics. Of the three types of variables, the work-related characteristics have the strongest influence on the propensity to adopt telework. Thus, focusing on these characteristics would be beneficial to an organization with interest in promoting telework because these traits have the greatest influence on the decision to adopt telework and they are controllable variables in a real life setting. After focusing on the work-related characteristics, if teleworkers have positive experiences and communicate about this experience with individuals in their social network, then this communication could lead to more individuals deciding to adopt telework. On the contrary, if teleworkers have negative experiences and report that to their friends or colleagues, then this could influence others to not telework. Thus, this communication within their social network represents the social influence that could occur. This social influence could act as a social

constraint or a facilitator, just depending on the direction of the effect of the influence on the individuals in the social network. Thus, the type of influence does matter because it could make a difference when trying to promote workers to telework. It is also important to note that having no social influence has no effect on the decision to adopt telework, which is not preferred over the positive influence. It would be most beneficial to have positive social influence because that could help increase the number of individuals who are teleworking. Thus, it would be advantageous to ensure that individuals have a positive experience, thus, they will speak positively about telework to others they interact. However, it must be acknowledged that it is unrealistic to isolate a single group of variables to focus on because in reality, different types of phenomenon are going on simultaneously.

In addition, the results reveal that the main source where telework was heard from is the media. Therefore, it is evident that the media is another area of focus for organizations that are trying to promote telework. Using the media to spread awareness of telework may increase telework adoption. However, it does not necessarily mean that everyone will have a positive telework experience. Thus, negative or positive social influences may still occur. Nevertheless, social influence is an aspect that is hard to control, thus, just focusing on raising awareness of telework through the media to promote telework adoption and providing support and/or accommodations to ensure that workers have a positive telework experience could be the only things to do to try to avoid negative social influence.

For future recommendations, the McMaster Telework Survey could include a question that asks the survey participants if they believe a formal telework program would motivate them to adopt telework. If the response for that question is positive, then it could be beneficial for a workplace to initiate a formal telework program given that a telework program could help regulate the work arrangements and provide support and resources for their teleworkers. At the same time, workplaces should take into consideration the results from this research, which indicate that telework is heard most from the media and that telework adoption is affected by several factors (e.g., social influence, socio-demographic, and work-related characteristics) when planning and/or executing a telework program. Thus, a useful way to promote the telework program would be through the media (e.g., print media (organization's periodic newspaper) or electronic media (ads on company's website)). If the telework program were a success, then employees would be content with the work arrangement and could very possibly speak to other colleagues, friends, households members and/or neighbors about telework in a positive manner, which could influence others to adopt telework.

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Chapter 4 Conclusions

The goal of this thesis was to explore the relationship between social influence and telecommuting. Some of the key issues which drove this research topic included the stresses and pressures of balancing work and personal life, as well as the concern with potential negative environmental impacts caused by the use of private automobiles (Fullerton and West, 2000; Golob and Hensher, 1998; Wade et al., 1994). Hence, telework provides the flexibility to work from home instead of the traditional workplace, which could help to decrease some of the environmental issues associated with driving private cars, as well as decrease amount of time spent commuting to and from work and increase time spent with family and friends.

The first chapter introduced some of the environmental concerns, a brief history of the study of telework, the origin of the term and concept of telework, and some definitional issues with the term telework. In addition, this chapter identified the significance of this thesis paper, the research objectives, as well as presented the organization of the proceeding chapters.

Chapter 2 explored the data from the McMaster Telework Survey to provide an overall sense of the data being analyzed. Analysis, such as a description of the sample, chi-square tests, maps of the teleworkers' and non-teleworkers' homes and workplaces, as well as a comparison of the observed and reported commute distances were conducted in this chapter. The results from the analysis aid in the understanding of telework adoption at a more detailed level within an academic institution in Hamilton CMA.

The third chapter took an in-depth look at the potential effects of the colleague connections variables from the survey. Hence, a descriptive analysis on the social influence characteristics of the sample was provided in this chapter. This chapter also carried the descriptive analysis from the second chapter to next level through the empirical analysis of social implications on the decision to telework. Thus, a probit analysis was computed for the socio-demographic, work-related, and social influence factors on the decision to telework.

4.1 Contributions to Telework Adoption Research

The following paragraphs consist of a brief discussion of the gaps in the literature, significance, and contributions of this research.

First, the topic on travel behavior aspect of teleworking has gained a vast amount of American perspective from past studies (e.g., Mokhtarian and Salomon, 1996a; 1996b; Saxena and Mokhtarian, 1997; Mokhtarian and Bagley, 2000). However, this topic lacks Canadian viewpoints (Alston, 1997). Thus, this research provides a Canadian outlook on travel behavior and telework adoption, which contributes to the existing, yet limited Canadian body of literature in this field of study. In addition, the existing body of literature in the fields of travel behavior and social implications is quite limited with only several exceptions (e.g., Axhausen, 2006; Dugundji and Walker, 2005; Páez and Scott, 2007). Thus, this thesis contributes to the growing body of literature on issues associated with travel behavior and social implications.

Furthermore, relatively little research has been done to explore the potential influence that social contact between coworkers may have on individuals' decision to adopt telework. Thus, the examination of the potential influence that social interactions may have on decision-making is important. In addition, the results from this research could help management become aware of the motivations behind telework adoption. Thus, this could contribute to new techniques to help motivate employees to adopt telework if that is the goal of the organization.

The socio-demographic, work-related and social influence characteristics are influences on the decision to telework. Of the three types of variables, the work-related characteristics have the greatest impact on the propensity to adopt telework. Thus, focusing on these characteristics would benefit any organization with interest in promoting telework because these traits are controllable variables and would most likely have the greatest effect on decision making relating telework adoption. Focusing on the work-related characteristics could result in teleworkers having positive or negative experiences and speaking about this workplace arrangement with their friends, colleagues, or household members. Hence, this transfer of information could encourage or discourage individuals to telework, thus, illustrating the effects of social influence in a social network as a social constraint or a facilitator. Thus, the type of influence present makes a difference when trying to promote workers to telework.

Furthermore, it is noted that the main source where telework was heard from is the media. Therefore, focusing on using the media to spread awareness of telework may increase telework adoption. However, it does not necessarily mean that everyone will

enjoy their telework experience. Hence, negative or positive social influences on the decision to adopt telework may still occur. Controlling for social influence in a social setting is a very challenging task, thus, focusing more on raising the awareness of telework through the media rather than trying to get individuals to speak positively about telework adoption may the more effective means of endorsing telework adoption.

4.2 Future Recommendations

For future studies, the length of the McMaster Telework Survey could be reduced. Questions pertaining to telework and other lifestyle choices and views on various issues have no effect on the decision to telework in the probit analysis. Therefore, those questions could be eliminated to decrease the length of the survey or make room for new questions in a difference part of the survey, such as the colleague connections section to see the extent to which social influence affects one's decision to adopt telework. In addition, the survey instrument is generic in the sense that it can be readily transferred to other organizations (e.g., private-sector firm and/or government agency) to learn if or how social influence affects the decision to adopt telework in a difference social setting. Furthermore, workplaces should take into consideration the results from this research, which indicate that telework is heard most from the media and that telework adoption is affected by several factors (e.g., social influence, socio-demographic, and work-related characteristics) when planning and/or executing a telework program. For instance, a useful way to promote a telework program would be through the media (e.g., print media or electronic media.

4.3 References

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