This is to certify that the

thesis entitled

THE USES OF CULLULAR TELEPHONY IN TAIWAN

presented by

Hsiu-Yueh Hsu

has been accepted towards fulfillment
of the requirements for

MS degree in Telecommunications

Joseph D. Straubhaar
Major professor

Date Nov. 5, 1992

THE USES OF CELLULAR TELEPHONY IN TAIWAN

By

Hsiu-Yueh Hsu

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Telecommunication

1992

ABSTRACT

THE USES OF CELLULAR TELEPHONY IN TAIWAN

By

Hsiu-Yueh Hsu

In order to gain some understanding of cellular telephone uses, this research accepted Rogers' diffusion theory. The purpose in this research was to investigate the differences between cellular adopters and non-adopters. The study concentrated on (1) how compatibility affects cellular adoption, and (2) how the individual acquires knowledge of cellular telephones.

From April third to sixteenth, 1991, a telephone survey was conducted in Taipei, Taiwan. A total of 130 were contacted, including sixty-five cellular and sixty-five fixed telephone users. The survey found that the majority of adopters had used the technology within the last six months.

The major findings were:

1. Cellular adopters had more opportunities to deal with others than did non-adopters.
2. Past experiences with mobile communications were positively related the adoption of cellular telephones.
3. Adopters were more likely to receive information about cellular from interpersonal contacts.

ACKNOWLEDGEMENT

From the beginning to the end of this project was a long way but I was not alone. I would like to express my heartfelt appreciation to those who helped me.

Dr. Joseph Straubhaar provided exceptional help when I really needed it with intelligent advice and patience. Dr. David McCarty contributed many constructive suggestions. Dr. Robert LaRose, as an academic advisor, always provided professional advice to my study as well as offered great contribution to this thesis. Dr. Charles Steinfield contributed to its early design of this project. Finally, I would like to thank Dr. Thomas Muth for creating the environment that stimulated this research.

In Taiwan, I enjoyed my association with Dr. Chao-Hsiang Chu and Mei-Lin Chai, who helped me with the actual survey. I would also like to thank Miss Wu of the Survey Center (United Daily News) and Mr. Yang of the Public Relations Department (DGT) in collecting information and articles for me.

This project would have never started without the support of my family. My parents, Ta-Hsieng Hsu and Chao-Chin Liu, provided financial and emotional support. My dear husband, Steven Dick, and his parents, Thomas and JoAnn Dick, supported me with encouragement and an American family home. Great thanks to Steve, he helped me edit many drafts of this project. This project would have never finished without him being there for me all the time.

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CHAPTER I

INTRODUCTION

The thesis is supported by an original research project: research subjects were Taiwanese subscribers of cellular and fixed telephone services. The purposes of the survey were to investigate the subscribers' (1) history with mobile communication, (2) task attributes, (3) sources of information about cellular, and (4) differences between cellular adopters and non-adopters. No cellular research studies had been conducted since the system was introduced in Taiwan. The researcher intended to find out the reasons for cellular adoption, and why rates of adoption have increased so quickly, by investigating the four factors outlined above. The research hypotheses used in the survey itself are outlined at the end of Chapter II.

This research and its analysis use the diffusion of innovations model (Rogers, 1983 & 1986) as their theoretical basis. The research relates two critical diffusion theory factors — compatibility of cellular and the acceptance of the innovation information — to past experiences, task characteristics and cellular knowledge in the process of adoption. The phenomenal growth rate of Taiwanese cellular telephone use is of special interest to this work.

A DESCRIPTION OF MOBILE COMMUNICATIONS

Cellular radio is the newest mobile technology in Taiwan, growing faster than the others. The description below includes the advantages and disadvantages of several types of mobile communications. The Figure 1-1 is

provided for the convenience of the reader and as an explanation needed later in this study.

FIGURE 1-1. Description of Mobile Communications.

Advantages	Disadvantages
Paging system	
Small, personal receiver, low cost wide-area range, easy to purchase and install.	One-way, impersonal, limited information transfer, long wait times for caller.
CB radio	
Low cost, easy to obtain, and easy to use.	No privacy, limited range.
Amateur radio	
Users own, operate and control system. Can be used where there is no fixed telephone. Worldwide range. Low cost.	Need to be licensed. Noisy communication. Illegal for business use.
Mobile telephone system	
Multiple switched channels reduce wait time. Can be where there is no wired telephone.	Long wait time, limited range, interference. Difficult to obtain channels.
Cellular telephone system	
Very limited wait times, almost private, no fading, nationwide, worldwide coverage soon. Data transmission coming but limited. Satellite access. Can bypass local carrier. Units can sometimes operate on IMTS.	Expensive but costs falling. Not yet in every area.

Note. From Dordick & Williams, 1986, p. 93-4.

Let us expand on the description of cellular technology. Generally, there are four essential principles of cellular architecture (Calhoun, 1988, P. 44):

1. Low power transmitters and small coverage zones.
2. Hand-off and central control.
3. Frequency reuse.
4. Cell-splitting to increase capacity.

Instead of depending on a single, powerful transmitter, cellular telephones divide service areas into numerous zones or "cells," each with their own mini-transmitter. In this system, multiple subscribers use the same channel

simultaneously, each transmitting and receiving via the antenna in their cell; each cell antenna relays the signal through leased lines to and from a mobile telephone switching office. The greatest advantage in a cellular network is that when cell traffic reaches saturation, it can be split into smaller cells for more capacity. With these features in mind, we turn to a discussion of the cellular telephone market and research studies, comparing Taiwan with the United States.

THE CELLULAR MARKET & RESEARCH STUDIES

In the U.S. in 1991, there were close to 7.5 million cellular telephone subscribers; that number is expected to reach 8.7 million in 1992 (Goldman, 1990). In Taiwan, cellular services began in July 1989 with only one domestic equipment manufacturer — Sanguan — who cooperated technologically with a U.S. firm. Most equipment still needs to be imported from the U.S. or Sweden (through AT&T, Ericsson or Motorola for instance). By October 1991, approximately 160,000 Taiwanese had subscribed to a cellular telephone system, and by the end of 1992 the number should increase to 440,000 (Yu, 1991).

As the rate of cellular adoption increases, the price of equipment and service decreases. The cost of a cellular phone in the U.S. had fallen to around $400, including installation and minimum subscription, from about $2,000 seven years ago when cellular phones were first introduced. The price is substantially lower when combined with other services in a package.

Startup costs for cellular service in Taiwan include more than just installation. The Directorate General of Telecommunication (DGT), the monopoly provider of transmission services, charges a total cost around U.S. $837 for an application for cellular service. The service costs include a $473 licensing fee, $110 installation fee, $182 security deposit, and $72 examination fee (Wang, 1990). Besides installation, the equipment can cost more than $2,000. Brand name (Ericsson or Motorola) cellular handsets cost even more (US $3,500, Tsai, 1991) because of import costs.

Since cellular technology was introduced in Taiwan, there has been only one long term survey of its use, commissioned by a cellular telephone sales agent. This market research found that cellular users were movie stars, singers, doctors, top executives, stock brokers, and criminals — drug dealers, gamblers, and prostitutes (Ling, 1990). In addition, the DGT and the College of Industrial Technique funded two shorter research projects (DGT, 1989, & Hung, 1988).

The DGT (1989) concentrated on potential adopters' needs and found that the convenience of being in touch while out on business was the most important reason for cellular telephone use. The study also found that potential adopters desired three important services: speed calling, call waiting, and call forwarding.

The College of Industrial Technique (1988) conducted a telecommunication policy study that briefly touched on the need for mobile communications. To summarize, the study suggested that telecommunication policy should facilitate the development of a mobile communications market.

The development would integrate (1) telecommunications service providers, (2) sources of research and development (R&D), and (3) companies producing telecommunication equipment.

On the other hand, there have been many research studies concerning cellular telephone use in the United States. They were including those conducted by the National Association of Business and Educational Radio (NABER), the Cellular Telecommunication Industry Association (CTIA), and common carriers.

The NYNEX study emphasized on the use of cellular telephones and estimated future market potential. The results indicated that twenty-seven million Americans would purchase cellular telephones within five years, while eighty-five percent of cellular users were satisfied with their phones (Yankelovich et al., 1990).

NABER's studies concentrated on types of profession and the specific tasks accompanied by mobile communication (Hershey & Shott, 1978). One of these studies found that users' business increased while driven mileage decreased through the use of mobile communications. A NABER study also found that the professions of mobile users commonly included medical, transportation, construction, manufacturing, communications and wholesale trade (ibid., p. 124, 127, 131 &137). CTIA tracked the profile of cellular users in the United States from 1987 to 1990. The association found out that a typical cellular user was a male executive, middle manager or owner of a small business, aged around forty (Sextro, 1990; Berrigan, 1989).

According to research studies in the U.S. and Taiwan (Sextro, 1990; Yankelovich et al., 1990; & Ling, 1990), the cellular subscriber is someone who does not travel far, just often. For example, they are locksmiths, lawyers, doctors, or middle managers. One concludes that cellular adopters have somewhat similar task characteristics. Further, they might have had similar experiences before using cellular telephones, and might get information through similar sources. One chief goal of this thesis is to establish the validity of these assumptions.

On average, there are ten thousand new cellular subscribers each month in Taiwan (Yu, 1991); the compatibility of cellular technology is remarkable. How is the adoption decision affected by sources of knowledge about cellular? Before entering into a full discussion of the Taiwanese cellular subscriber, this researcher offers some background information on regulations for cellular use, and on abuse of these regulations.

REGULATIONS AND USES OF MOBILE RADIOS IN TAIWAN

Apart from cellular telephone, mobile communications in Taiwan has been growing over the last few years but the industry is still in regulatory difficulty (Wu, 1991a & 1991b). The government restricts mobile radio, such as amateur radio (VHF 144-146 MHz & UHF 430-440 MHz), for national security reasons. Even Citizen Band (CB) radio (25-30 MHz) is limited to a small population, e.g., security services, construction, manufacturing, bus-lines, and the taxi trade (ibid.).

Though the Taiwanese government has placed restrictions on amateur and CB radios, many people ignore them. These radios continue to be used without license or permission. For instance, some prostitutes have illegally "worked" using the airwaves (Wu, 1991a). They "made friends" with other radio users in order to steal their affections and money. After they had made their money, they disappeared, changed names and channels, and began again.

In the daytime, radio transmissions are almost all for normal business, conducted by, for instance, taxi or bus drivers, or stock brokers. After midnight there are more radio communications than in the daytime. All sorts of illegal businesses are on the air — drug dealers, prostitutes, smugglers, black-marketeers. The amount of air traffic causes turbulence in the frequencies. There is an urgent lesson here for the DGT: nationwide radio channels need to be relocated (Lee, 1992), and an effective policy for mobile radio needs to be established.

The restrictive and ineffective policies for CB and amateur radio systems have created a big demand for other mobile services — especially paging and cellular systems. There is a large paging market because the public cannot easily access other mobile technologies. Almost thirty percent of Taiwan residents carry pagers (DGT, March 1991). Pagers are the most popular mobile communication because they are the cheapest and most accessible.

Along with paging, public demand for cellular telephones has probably grown in part due to a general curiosity about mobile communications. In the first two years after cellular technology was introduced in Taiwan, two percent of

residents started using it (Yu, 1991). Considering the expense (U.S. $3,000 to U.S. $4,500) and long application process, the rate of cellular adoption has been very fast. In comparison, the 1991 penetration rate of U.S. cellular subscription was only 2.81 percent (Goldman, 1990).

The fast growth of cellular telephones has created a strange and illegal situation. Several users share one number in order to avoid the crowded application process and to reduce costs ("Few Cellular," 1990). Number-sharing causes not only technical problems but underestimates of the cellular market size. Due to this illicit use of cellular telephones, the system is overloaded with transmissions.

The system on the whole could have been planned better. The DGT should construct more cell-sites in major cities. There are always complaints about calls not getting through. This is especially true in Taipei city — home of more than half the Taiwanese cellular market. Following complaints from cellular users, the Long Distant Telephone Department (LDTD) which manages the cellular system, has plans to overcome the shortcomings. LDTD is tripling the number of cell-sites, redesigning communication channels, and increasing reuse of frequencies (Lee, 1990a). Access to communication channels may never catch up with the growth of cellular population, and a poor original design is probably to blame.

The system was originally designed to serve the only super-highway that follows the west coast of Taiwan; the plan copied from a former U.S. Bell system. The Bell company had tested the concept by providing travelers with

linear-cell telephone services for the Metroliner train between New York and Washington, D. C. (Bartee, 1986, p. 250 & Dordick, 1986, p. 238). DGT did not anticipate that cellular adopters would do most of their business in the major metropolitan areas instead of along the highway.

The Taiwanese cellular system provides fewer channels than it normally should because of technical problems. The Taiwanese cellular system is modeled after the North American System — Analog Mobile Phone System (AMPS). A typical AMPS cellular network uses 312 channels divided into either seven sets of 44 to 45 channels or four sets of 78 channels (Bartee, 1986, p. 258). When cellular technology was introduced, there were only fifteen cell bases in the Taipei district (Lee, 1990a). By the end of 1990 in Taiwan, there were only 30 cell sites with 36 channels each (825-845 MHz & 870-890 MHz). These 1,080 channels must serve metropolitan Taipei with nearly 60,000 cellular subscribers (DGT Report, 1990).

When this research was conducted, the new telephone system had only been available in Taiwan for about one and half years. In that time, less than six-tenths of one percent of Taiwanese subscribed to cellular telephones (DGT, March 1990). Today, more and more Taiwanese want cellular telephones, and stand in line to apply for cellular services from the DGT. By the end of 1992, one out fifty persons will carry a cellular phone (Yu, 1991). With the basic idea of this study and a background of Taiwanese mobile communications established, now we turn to review relevant literature in Chapter II.

CHAPTER II

LITERATURE REVIEW

THEORETICAL BASIS — DIFFUSION OF INNOVATION

Rogers (1983) conceptualized the diffusion of innovations or new ideas as a series of actions and choices occurring over time; his studies of innovation are crucial for this thesis, and are among the principle works reviewed in this chapter. Studies by other scholars reviewed here help form the theoretical framework of the research.

For an individual, the diffusion process consists of evaluating new ideas and deciding whether to incorporate the innovations into ongoing practice. In Rogers' concept, decision making has five stages: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 1983, p. 163). First, an individual builds up knowledge of an innovation. Then he or she forms an attitude toward the innovation. Third, and most important, the individual makes a decision to adopt or reject the innovation. This decision will determine whether the later stages — implementation of the new idea and confirmation of the decision — to continue or not.

The characteristics of an innovation, as perceived by members of a social system, determine its rate of adoption (Rogers, 1986, p. 117). According to Rogers (1983, 1986), five attributes of innovations affect adoption: relative advantage, compatibility, complexity, reliability, and observability.

This study is important because cellular technology is relatively new in Taiwan and needs analysis. As mentioned in the introduction, the present study

focuses largely on the "compatibility" attribute in relation to Taiwanese cellular technology. Since "compatibility" is prominent attribute to an innovation, this research intends to find out why the Taiwanese cellular adoption rate has grown so fast by studying this attribute. The attribute will be studied in two aspects: task characteristics and past experiences. The researcher discusses these aspects in the next two sections of this chapter.

Recall that compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 1983, p. 223). According to Rogers' concept (ibid.), an innovation can be compatible or incompatible with previously introduced ideas, or with the desire to meet clients' needs.

In the present study, the researcher uses past experiences of mobile communications as "previously introduced ideas." "Task attributes" are used to link "client needs" to the cellular adopters' professions. The researcher collected previous research about the professions of cellular users; since most adopters use cellular telephones for business, the adoption of cellular technology relates directly to their professions. The most relevant task attributes originate from several key professions, the practitioners of which are likely to use cellular telephones. The cellular adopters use the technology to complete tasks and therefore to meet clients' needs.

Sims et al. (1976) tested the reliability and validity of task attributes measurement in several professions. Building on this research, it was possible to reliably collect data concerning professions. The measurement also defines

attitudes about what profession and general job satisfaction mean (O'Reilly et al., 1980). Here, task attributes are used to test the compatibility of cellular technology.

USERS' PROFESSIONS AND TASK ATTRIBUTES

"Can I improve my work by subscribing to cellular services?" One indication of the compatibility of an innovation is the degree to which it meets the requirements of a potential user's clients (Rogers, 1983, p. 225). In other words, the potential for adoption is related to work: an individual has to complete the tasks at work, he or she has to meet clients' needs.

A successful mobile communication system should fulfill the clients' needs as well as fit in the user's personal perceived needs. Most mobile communicators have to deal with business on the road, changing errands or time schedules, making appointments, serving the urgent needs of clients, and so on. Before positting two key task attributes — autonomy and dealing with others — to define the mobile users' professions, it is necessary to state why this research passed on the other four attributes from original studies (Hackman et al., 1971; Sims et al., 1976).

Generally, there are six categories of task attributes. Besides the two selected by this researcher, the rest are: variety, task identity, feedback, and friendship. First of all, according to the study of Sims et al. (1976), "friendship" tended to load heavily with the factors "deal with others" and "variety," furthermore, "autonomy" and "feedback," "task identity collapsed into a single

factor. Second, considering the questions needed to be translated into Chinese, this researcher chose the categories possibly best accepted by the Taiwanese social background. Thus, only "autonomy" and "deal with others" will be investigated in this research.

The self-employed person has a high level of autonomy attributes, as in the case, for instance, of a professional locksmith. While working on one case, the professional can arrange later business or adapt his or her schedule. Mobile technologies fit in well with the lifestyles of those professionals who are required to be in touch, and mobile devices increase their accessibility.

Through personal experience with a locksmith, this researcher knows that they often have all the needed equipment in a van. This locksmith reported that his cellular telephone was expensive, but still profitable to use for work. The use of a cellular telephone allowed the locksmith to meet his clients' needs more easily than if he had not adopted the technology. It could be said that the cellular adoption was compatible with his lifestyle.

Autonomy, as Hackman et al. (1971) define it, is the extent to which employees have a major say in scheduling their work, selecting equipment, and choosing procedures to be followed. For example, surgeons must decide what surgical procedure to use in a given situation. The lawyers have a major say in the way they handle a case as long as the clients are satisfied with their efforts.

"Dealing with others" is another task attribute the researcher chose to study in mobile users. It is defined as the degree to which a job requires employees to deal with other people to complete the work (Hackman et al.,

1971). Middle-managers, as common users of cellular telephones, coordinate occasional problems and allocate work to certain people (Griffin, 1982, p. 137). Their role requires them to deal with people more often than a line-worker might.

In Taiwan, most reporters carried pagers before cellular telephones were introduced. Newspaper agencies currently only distribute cellular telephones to top or experienced reporters, because costs are still very high. The reporters seemingly must use every opportunity to deal with people, yet, what is more important, they need to be contacted immediately, as news develops. They have to interview people (deal with others) first, before they complete their work by writing stories.

The "deal with others" attribute of their profession makes reporters more likely to communicate on the phones. Those who deal with others in their work will use phones more heavily than those who do not have to deal with others regularly. Mobile technology will be a need for "communicating" workers. Upgrading to cellular will be efficient for them. Perceived efficiency at work increases the compatibility of cellular telephone in the Taiwanese workplace.

In National Association of Business and Educational Radio (NABER) research, a radio system was found facilitate exchange of location and operational information, deployment of personnel, maintenance of contacts with clients and conduct of business transactions (Hershey et al., 1978, p. 133). Almost sixty percent of business radio users reported an increase in the amount of business transactions (ibid., p. 135). The increase also meant those

business persons could satisfy more clients and so increase the compatibility of the technology they had adopted.

Task attributes may drive an individual to adopt mobile services to fulfill assignments more easily. Mobile communicators use the services, as noted above and below, mainly for business. This researcher intends to locate mobile users' task attributes by their professions and positions. Then, through measuring the task attributes, the researcher can determine the compatibility of cellular technology.

Cellular service initially targeted two broad populations: business persons and affluent gadget lovers. Future market growth might depend on commercial transportation, managers and so forth (Berrigan, 1989, p. 46-8). From 1987 to 1990, Sextro (1990, p. 50, & 52) showed that the typical job title of cellular adopters decreased from CEO to middle manager. The cellular market showed substantial growth in construction, salespeople and other service providers (See Figure 2-1). Here, middle managers, as described above, are the persons who possible have more opportunities to deal with others.

Figure 2-1. US Research Showed Typical Professions of Cellular Users.

YEAR	PROFESSION	POSITION
1987	small business sale/service	CEO/president
1989	small business; construction	middle manager service provider
1990	white collar sales	middle manager

Note. From Sextro and Yankelovich et al., 1990.

In 1978, the study of Hershey et al. also found that mobile telephone users were primarily employed as top management (81%), professionals (10%), supervisors, sales, and drivers (5%, see Figure 2-2). It was found that pager users were primarily doctors, lawyers, supervisors, specialized technicians, and "blue collar" service workers (Hershey et al., 1978, p. 123, See Figure 2-2). As noted above and below, the professionals — doctors or lawyers — are the persons who enjoy a high level of autonomy.

Figure 2-2. US Research Showed Typical Professions of Mobile Users.

	PROFESSIONS	POSITION
MOBILE PHONE	manufacture, construction trade, transportation	top management, professional supervisor, sales
PAGING SYSTEM	medical, transportation construction, trade	professional, top management

Note. From Hershey et al., 1978, p. 124 and 137-8.

One group of possible cellular users, skilled professionals (e.g., doctors or lawyers), as noted by Griffin (1982), have a horizontal specialization in organizations such as public law firms, general hospitals, etc. (p. 136). Their tasks are a function of expertise instead of a hierarchical position. Griffin's (1982) idea is that the professional task of such specialists involves diagnosing problems and choosing predefined methods for dealing with the situation. These professionals enjoy a high degree of autonomy, because of their expertise (Griffin, 1982, p. 137). No matter where they are, doctors, for instance,

need to be reached in emergency situations. Cellular telephones will help with effective communications.

Recall, the adoption of an innovation relates to task attributes. According to Rogers' (1983) concept, an individual could be motivated to adopt the new technology by recognizing its suitability for meeting the clients' needs. Through the adoption of a cellular telephone, one might ask, can an individual finish his or her assignments more efficiently, to satisfy clients? If an individual satisfies more clients, the innovation is compatible instead of incompatible.

PAST EXPERIENCE WITH CELLULAR TECHNOLOGY

Rogers (1983) generalized that the compatibility of an innovation with a preceding idea can either speed up or retard its rate of adoption. Knowledge of an innovation is based on familiarity and past experiences. Potential adopters want to know only whether the new technology is better than an existing practice. If a new idea is completely congruent with existing practice, there would be no innovation (Rogers, 1983, p. 225).

When new technology becomes available, past problems with an existing practice or device contribute to the perceived need for upgrading. For example, pager users often find it inconvenient to stop and return a call when they are caught in a traffic jam or a road accident. They may adopt cellular telephones to compensate for the one-way limitation of paging. Again, conventional mobile telephones appeared obsolete compared to cellular technology as soon as the new technology become available. According to the

results of research conducted by common carriers and Cornell University, cellular technology could solve two key problems. Users cited dissatisfaction with conventional mobile phones, in that, one, they could not get a line (21%), and two, they had poor reception (20%, Hershey et al., 1978, p. 140).

On the other hand, when dissatisfaction with a current device occurs, a person may stop using existing technology or adopt future innovations slowly. This situation is an undesirable aspect of compatibility, called "innovation negativism" by Rogers (1983). Nevertheless, the person who needs mobile communication for business is more likely to move to a better and more beneficial technology than away from all similar technologies.

When users are dissatisfied with conventional mobile phones, they may upgrade to cellular or stop using mobile devices. Once a person begins using one mobile transmission system, it is more likely he or she will upgrade to new or other mobile communication services. It is less likely that he or she will quit using mobile services, since these communication devices are needed for work. Of course, experience may affect the later use of new mobile technologies.

Another survey conducted by NABER questioned one thousand NABER members about mobile telephones and paging systems. Bearing on compatibility was one interesting factor in NABER's research, the "upgrading" phenomenon. More than seventy percent of current business radio users had prior experience (see Table 2-1) with mobile communications before acquiring their present equipment (Hershey et al., 1978, p. 132-3).

Table 2-1

Prior Uses of Mobile Communications

Type of Equipment	Percentage of Users
Citizens Band	40%
Paging System	15%
Mobile TEL	21%
More Than One	12%
Others	12%

For Rogers (1983), several innovations can have a functional interrelatedness. In the minds of potential adopters, one innovation may be perceived as closely related to another innovation (Rogers, 1983, p. 226). Mobile communications, including citizen band radio, amateur radio, pager, mobile telephony and later cellular technology, all have a common goal. This is an example of what Rogers (1983) called "technology clusters."

In the radio common carrier family, the radio paging and mobile telephone businesses grew up as sibilings. Some U.S. organizations in larger cities still operate mobile telephone and paging systems or cellular telephone systems in the same business environment. The clusters encourage the adoption of one new technology that comes with several others. For instance, some companies offer discount time on paging systems that go with the purchase of cellular telephones: the strategy helps to facilitate the marketing of pagers or cellular telephones. It is called "bundling" or "packaging" (Cooper & Olsen, 1987). Or again, a paging company which lacked cellular connections had become an agent for a cellular operator in package marketing (Olsen,

1987).

Though cellular telephone systems process the allocation of frequencies differently from paging or other mobile systems, some companies in the U.S. package a variety of different services as a competitive marketing strategy. The price for a package of various services is lower than their individual cost. In other words, these companies cluster technologies and increase the economic benefits to encourage the potential market.

Further, technology clustering and package marketing inevitably cultivate the (potential) adopters with technological knowledge. Familiarity and past experiences with mobile communications build up knowledge about new mobile technology. In this way knowledge accumulation helps to increase the compatibility of a mobile innovation and its adoption rate. The researcher now turns to Rogers' concept of "knowledge of an innovation," and ends the chapter by briefly discussing the use of mobile telephone systems and by stating this research hypotheses.

KNOWLEDGE OF AN INNOVATION

Rogers (1983) maintained that the diffusion of an innovation was an uncertainty-reduction process. Individual information-seeking is motivated by the need to decrease uncertainty about an innovation's expected consequences (Rogers, 1983, p. 170 & 217). If someone has a perceived need of an innovation to fulfill work-related requirements, he or she may seek further information.

An individual looks for information about innovations to apply to his or her own situation. Before adopting or rejecting an innovation, based on Roger's concept of the decision-making process, a "knowledge stage" and/or "persuasion stage" is possibly necessary. The public is more likely to become aware of an innovation through mass media channels in the "knowledge stage." On the other hand, being persuaded to adopt an innovation probably depends more on interpersonal contacts in a "persuasion stage."

Rogers (1986) defined a communication channel as the means by which messages get from one individual to another. Mass media channels are more effective in creating awareness of innovations. Interpersonal channels are more effective in forming, and in changing, attitudes toward a new idea, and thus in directly influencing the decision to adopt or reject the idea (Rogers, 1986, p. 117-8). In other words, mass media channels are relatively more important at the knowledge stage and interpersonal channels are somewhat more important at the persuasion stage (ibid., 1983, p. 198-9).

The present research is aimed at finding out how the public knows about cellular technology. By either interpersonal or mass media channels, the public gains knowledge about cellular technology: from which sources did cellular adopters and non-adopters learn about the technology?

According to Rogers (1983), mass media messages can lead to a change in weakly held attitudes. Taiwanese DGT (1989) researched the potential cellular market before it introduced cellular technology, surveying the information sources of potential cellular adopters. The study concluded that

commercials in the television news programming (58.8%) would be the most effective of mass media channels. The Central Broadcasting system (56.0%) was found to be the second most effective channel. Third were business and management magazines (40.7%).

Mass media function as the principal conveyers of information about innovations, and widely inform people about the risks or benefits of innovations (Bandura, 1986, p. 144). Mass media messages are too general to provide the specific kind of reinforcement that the individual needs to confirm his or her beliefs about the innovation (Rogers, 1983, p. 170). Predisposed people may not switch attitudes as a result of advertising campaigns. Therefore interpersonal networks are necessary to overcome the social-psychological barriers of selective exposure, perception, and retention (ibid., p. 198).

Most potential adopters evaluate an innovation through the subjective opinions of near-peers who have previously adopted the innovation (Rogers, 1986, p. 118). These near-peers thus serve as social models, whose opinion is most convincing. Adoption behavior observed through interpersonal contacts can act as a vicarious trial for late adopters (ibid., 1983, p. 170 & 231), and the modeling effect of the interpersonal network may accelerate or check the adoption decision for new technology.

For the more cautious potential adopters, the modeling benefits accelerate the effects of persuasion by weakening the restraints and enlarging the vicarious incentives (Bandura, 1986, p. 146). This is why cellular salespersons try to alter people's preferences by discussing the costs-benefits

ratio. In a research project conducted by the College of Industrial Technique in Taiwan, the adoption of mobile telephones was affected most by the influence of persuasive salespersons, and then by customers' perceived need (Hung et al., 1988, p. 79).

An individual must be able to conceptualize information from either the mass media or interpersonal channels about innovations, and apply it to his or her situation. In researching weed spray in Iowa, Beal & Rogers (1960) concluded that interpersonal channels were somewhat more important for late adopters than for early adopters. An inverse result was found in a study of home computers (Rogers et al., 1982). Interpersonal networks are more important than the mass media in creating awareness-knowledge of home computers (Rogers, 1986, p. 123).

Still, Rogers generalized that mass media channels are relatively more important for early adopters than for late adopters (Rogers, 1983, p. 201). Communication messages can persuade innovators more easily than they can persuade laggards, because innovators have more favorable attitudes toward new ideas (ibid., p. 205). According to Rogers (1986, p. 134), early adopters have different communication behavior from late adopters. Early adopters are:

1. More directly in communication with scientific and technical sources of information;
2. More exposed to interpersonal communication channels, and more highly interconnected through network links to the system;
3. More exposed to mass media channels, and relatively less dependent on interpersonal communication channels.

Why are these early adopters highly interconnected to their interpersonal

network but depend less on these network links? Because of their innovative attitudes — and early adopters can be opinion leaders or models in promoting an innovation in their social networks. They are exposed to mass media and interpersonal channels more frequently than late adopters. However, Item 3 in the list above suggests that the early adopters depend more on mass media channels and less on interpersonal channels. It is more likely that the potential adopters learn innovative technology from a model in the social networks. On the other hand, the "models" learn from outside the social networks, since they are more "cosmopolite" than late adopters (ibid.).

In the diffusion theory cited above, there is a difference in communication behavior when it comes to the knowledge and persuasion stages. Yet there are conflicts in the communication behaviors of early adopters: they are highly exposed to both mass media and interpersonal channels, but less dependent on interpersonal contacts. In this cellular diffusion study, the researcher would like to find out which channel is more important to the adopters overall.

HYPOTHESES

One of our purposes in this research is to investigate the differences between adopters and non-adopters. We concentrate on (1) how compatibility affects cellular adoption, and (2) how the individual acquires knowledge of the innovation.

The attribute of the compatibility of cellular telephones was studied to see how compatibility may have affected the adoption process. The present

research used two aspects of the process — past experiences and task attributes — to investigate the compatibility of cellular telephones. Concerning task attributes, the researcher rationally connected it to "meeting the clients' needs" at work, then to the adoption of the cellular telephone. It is hoped this rationale would provide a deeper insight into an individual's working conditions when it comes to the meaning of innovation compatibility.

Based on Rogers' generalizations, we conclude that the early adopters of innovations tend to be inclined to use mass media and, at the same time, to be engaged in interpersonal contacts. However, when it comes to the adoption decision, which channels — mass media or interpersonal networks — are more important? Following the literature review, this researcher developed the following hypotheses.

Six hypotheses were proposed. The first two concerned task attributes and compatibility.

H1: An individual's autonomy at work is related to his or her adoption of a cellular telephone.

H2: An individual's level of opportunity to deal with people is related to his or her adoption of a cellular telephone.

The next two hypotheses dealt with compatibility with previous innovations in mobile communications.

H3: An individual's past experiences with mobile communications are related to his or her adoption of a cellular telephone.

H4: The more frequently a person uses other kinds of mobile communications, the more he or she knows about cellular telephones.

The following two concerned sources of information about cellular related to adoption.

H5: An individual's awareness of cellular from mass media channels is related to his or her adoption of a cellular telephone.

H6: An individual's perception of information gained through mass media channels is related to his or her adoption of a cellular telephone.

CHAPTER III

METHODS

In this chapter the researcher first describes the sample population and procedures used in this survey. Then she introduces the questions asked in the survey, paying special attention to the operational variables involved. Finally the methods of analysis are laid out, together with the safeguards used to maintain reliability and validity.

SAMPLE

The sample population for the present study included both Taiwanese cellular and fixed telephone subscribers. The Taiwanese cellular system is installed in three main districts: Taipei, Taichung, and Kaohsiung. These districts are about the size of American counties. The researcher selected the Taipei District as the target area for this research. In this district, there were 2,267,513 fixed telephone users (including 427,369 unlisted households) and 59,083 cellular telephone users (DGT, February 1991).

The fixed telephone sample was selected by telephone directory sampling; the researcher used multistage sampling in the telephone directory. These unlisted customers include non-registered citizens, non-citizens, recent movers, and people without a telephone. Multistage sampling selects the subjects systematically with a sampling interval starting from a random number. The sampling interval is adjusted to consider an expected number of exclusions (unlisted people), making the sampling interval smaller and thus over-sampling

to compensate for unlisted subscribers. The compensation interval is arrived at multiplying the listed population (*N*) by the percentage of listed people (*P*) as in the formula below.

The sampling interval (*i*) can be calculated: $i = N p/n$ (Sudman, 1983, p. 172). In this formula, *n* is the desired sample size. For instance, if the listed fixed telephone users were 81.15%, there were 1,840,144 listed people and the researcher set the desired sample at seventy-five, then 1,840,144 * 81.15% /75 =19,910.36, and the sampling interval was 19,910. The researcher randomly selected the starting digit 8, so the second subject was the 19,918th listed person. Each 19,910th person was selected until the desired sample size was reached.

Originally this researcher intended to sample cellular users by the same method (telephone directory sampling) as fixed telephone users. However, after dealing with the DGT over a month, which was to have provided a subscriber list, support for this project was withdrawn without explanation. The researcher asked for cellular telephone prefixes instead.

To sample cellular telephone users, the researcher used random digit dialing (RDD). Theoretically, RDD is more random than telephone directory sampling, because the random number table is sufficient to give each element in the population a chance of selection (ibid., p. 165). RDD can reach the whole population including the unlisted. However, it takes more time and labor to complete the desired sample size due to a much greater chance of reaching disconnected or invalid numbers. Table 3-1 below compares random digit

dialing (cellular telephone samples) with telephone directory sampling (fixed telephone subjects).

In Taiwan, the cellular phone numbers have nine digits. The Taipei prefixes were from 09011 to 09018 (February 1991). Within the 09018 group, "09018-8837" was the last number permitted by Long Distance Telecommunications (the department overseen by DGT that manages the cellular service). The researcher took only the first four digits (0901) as a prefix, and sampled the other five digits from a random number table (Beyer, 1968). The first number had to be among 1 to 8, so all numbers beginning with 0 or 9 were discarded.

On successfully connecting with a telephone line, the researcher would request the head of a household for a residential line, or the major owner of the cellular telephone. The second choice was to ask for the spouse. The last choice was to interview the current user of the line. If the head of a residential line happened to be a cellular owner, the subject would be discarded.

In Taiwan, people work normally from 9:00 a.m. to 5:00 p.m., Monday through Friday, 9:00 a.m. to noon on Saturday. It is easier to reach the main users of cellular telephone lines during their work time. Thus, cellular adopters were surveyed from 10:00 a.m. to 5:00 p.m., Monday through Saturday. Heads of households in the fixed telephone system are much easier to reach after work. The researcher decided to call residential lines from 6:00 to 10:00 p.m., Monday through Friday, 2:00 to 10:00 p.m. on Saturday, and 10:00 a.m. to 10:00 p.m. on Sunday. This way one could hope to reach more main users.

The researcher defined the main user as the head of a household.

For all subjects, if the interviewer could not reach the subject on the first try, three more attempts were made. If desired numbers could not be reached after four tries, or if line holders refused to be interviewed, the number was recorded as a non-respondent. In these situations, a substitute number replaced the non-responding one. For random digit dialing, the following number (in the random digit table) replaced the non-respondent one. In the telephone directory sample, the next listed number substituted for the selected phone line until a valid subject was reached.

PROCEDURES

The pretest included ten persons — five fixed and five cellular users, and helped determine interview lengths and flaws in the questionnaire (see appendix A). The pretest lasted one week, from March 2 to 9, 1991. It took an average of two and half minutes to interview fixed telephone users, and about four minutes for cellular users.

Two forms of questionnaires were used, one for fixed telephone users (see appendix C), and the other for cellular (see appendix B). The questionnaires were revised after pretesting. The researcher altered items of Questions 1 and 8 bearing on the frequency of telephone use. Almost every pretested respondent reported making twenty-one or more phone calls (cellular or fixed) weekly, some called this much daily. Considering the frequency distribution of usage, the researcher added more items and increased the

response categories to include much higher frequencies.

The actual survey lasted from April 3 to 16, 1991. Due to the short time available for this project in Taiwan, the researcher was forced to settle for sixty-five valid users of both fixed and cellular telephone users (having contacted a total of 551 households). Interviews continued until the necessary numbers of each type of subject (fixed and cellular) had been reached (See Table 3-1).

In fixed telephone households, ninety-four numbers were called. Nineteen households (22.62%) refused to be surveyed, nine residential lines were no answers (after three callbacks), and one was disconnected. The researcher began with 457 cellular numbers in all. Because of random digit sampling technique, 309 were invalid or disconnected numbers. Additionally, there were seventy-five cases with no answers after at least four callbacks. Three users asked to be called back at some other time, but could not be reached again. Invalid or unanswered numbers may have been due to users roaming out of the service area, or turning off the cellular telephone sets. Some could not access to a channel at all, on account of system overload. Only eight people (10.96%) completely refused to be interviewed by cellular telephone.

Table 3-1

Frequency of Calls in This Telephone Survey

	Disconnected/NIS	No-answers	Refusal	Completed
Fixed	1	9	19	65
Cellular	309	75	8	65

QUESTIONS AND OPERATIONAL VARIABLES

The questionnaires were in three parts: Part I addressed past and present experiences with mobile technologies, Part II focused on telephone uses and task characteristics, and Part III introduced demographic characteristics. The questions in Part I to Part III, an examination of the operational variables involved. Please see Appendix B and C, the questionnaires for cellular and fixed telephone respondents. The questionnaires was structured for the convenience of the subjects; the present discussion is organized around significant variables, which are of central concern to the researcher.

According to the research design, two sets of relationships were defined for this research. In the first set, the independent variables would be: demographic variables, task attributes, and past experiences. Knowledge of cellular telephone would be an intervening variable. The adoption of cellular telephone would be the dependent variable. In the second set, the adoption of cellular telephone would be the independent variable, the uses of cellular telephone would be the dependent variables. The variables were operationalized as follows.

1. **Demographic variables**: These variables included sex, age, education, profession, and personal monthly income. Six questions in Part III of the survey addressed demographic variables. Question 2 categorized age into the groups 18-24, 25-30, 31-40, 41-50, and 51 or more. Question 3 defined five categories of education: uneducated, elementary/junior high school, high

school, college/university, and graduate school. Monthly income, Questions 4, included five choices as well: NT$20,000 or less, NT$20,001-30,000, NT$30,001-40,000, NT$40,001-50,000, and NT$50,000 or more. Open-ended Questions 5 and 6 (see appendix B) asked subjects for their occupations and job titles.

The researcher categorized professions into five levels according to occupation and job title (see Appendix D). The levels were unskilled workers; semiskilled workers; semiprofessionals, executives, or skilled workers; professionals or superior executives; high level professionals or top executives. Pavalko (1971, p. 113) and Centers (1949, p. 51) have summarized the typology of occupations.

2. **Task attributes**: This category defined the job characteristics and included two variables: autonomy and the opportunity to deal with others. Hackman et al. (1971) originally proposed six categories and the researcher chose two, based on the professions and positions of mobile users. Individuals' task attributes are related to their professions (Griffin, 1982; Sims et al., 1976).

Part II, Question 10 asked the extent to work with others, and Question 12 determined the extent to work alone. Question 11 asked the extent to be supervised. Question 13 investigated how far an individual had to deal with others. Questions 11 and 12 addressed "autonomy," 10 and 13 "dealing with others." All four questions had a five-point scale of response: very much, much, fair, rare and no amount. The researcher selected the questions by their factor loading and "communality" (See Table 3-2) as described in the original study.

Table 3-2

The Factor Loading & Communality of Task Attributes

	factor loading	commu-nality
Autonomy		
1. Be supervised	.78	.68
2. Work alone	.68	.52
Deal with Others		
1. Work with others	.57	.36
2. Deal with others	.64	.49

Note. From Sims et al., 1976, p. 202.

In analyzing the data, the researcher, having assigned numerical values to the responses (for instance, 5 through 1 on a five point scale), added paired questions together to create a single measure of each variable. Since "autonomy" was tested by a positive and a negative question, Question 12 was recoded and added to Question 11. The Mean of those two paired questions became the middle points of the categories "autonomy" and "deal with others." The measure below Mean *(M)* would be a low level. The range between *M* and *M* plus a Standard Deviation *(SD)* would be a middle level. If the calculated measure was above "*M + SD*" it would be a high level of "autonomy" or "deal with others."

3. **Past experience**: According to NABER's research, some organizations did use other mobile services before subscribing to mobile telephone. The present research investigated related prior mobile experiences

among regular and cellular users. Mobile services, in this project, included pagers, citizen band (CB) radios, mobile telephones, and certain other services (excepting cellular telephone).

Five questions in Part I (Questions 1 to 5) surveyed past experience with cellular telephone. The idea of these questions originated from NABER's study (Hershey et al., 1978). Question 1 asked the weekly frequency of fixed telephones use (The categories were changed to higher frequencies after pretesting). The categories were: 0-9, 10-20, 21-40, 41-60 and 61 or more. When analyzing this variable, the first four categories (below *M*) were collapsed as a low level of fixed telephone usage, and the last (above *M*) would be counted as a high level of usage.

Question 2 asked subjects if they had any past experience with mobile communications. Question 3 asked which type of mobile communication individual used; it included four categories: paging, citizen band radio, conventional mobile telephone, and others. Question 4 asked the usage of the mobile communications, either in the past or presently. There were five possible responses: more than once a week, daily, several days a week, once a week, and less than once a week. In later statistics, these first two categories (below *M*) would be a low level of mobile communication usage, and the rest (above *M*) would be a high level of usage. Question 5 asked if respondents' experiences with mobile communication affected their likelihood of using cellular telephone. The question had a five-point scale: very likely, likely, fair, not so likely, and not at all. These categories would be recast as the same as

Question 4.

4. **The adoption of cellular telephone**: Question 6 (in Part I) simply asked all subjects if they used cellular telephones.

5. **Knowledge source of cellular telephone**: This included two categories: mass media and interpersonal channels. Rogers' diffusion of innovation model has two initial stages — knowledge and persuasion. Mass media would function better in the knowledge stage, while interpersonal contacts would affect the innovation adoption in the persuasion stage.

In this research, mass media channels included mass direct mails (DM), newspapers, radio, and television. DMs are produced in mass amounts and delivered to individuals. Although the researcher did not include magazines or other trade publications which are crucial to the early adopters on the official answer list (that only the surveyers saw) due to shortening the length of Question 11, no subject's answer to this question reported these media. Interpersonal channels included sales agents, in-store display (sales), and friends or colleagues.

There were five questions in Part I (Questions 10 to 15), surveying the level and acceptance of cellular information. Question 10 was designed to define personal knowledge of cellular technology. Its purpose was to screen out the people who did not know anything about cellular telephone. It had a five point scale: very much, much, fair, rare and no amount. In data analysis, these first two categories would be a low level (below M) of knowledge about cellular, the third would be a middle level (between M and $M+SD$) , and the rest would

a high level (above *M+ SD*). Question 11 asked for sources of the cellular knowledge. The categories included mass media and interpersonal channels as described above. The content of this question referred to the studies of Hung (1988), DGT (1989), NYNEX (1990), and Cellular Business (February 1990).

Questions 12 to 15 originated in the content analysis of CB radio by Hershey et al. (1978). These questions had five-point scales as well: very important, important, helpful but not necessary, not so important, not important at all. Question 12 asked the importance of mass media channel. These first four categories (below *M*) would be a low level of importance of mass media, and the last (above *M*) would be a high level of importance. Finally, Questions 13 to 15 tested the importance of interpersonal contacts. In later statistics these categories would be collapsed into a low level of importance which is below *M+SD* , and a high level which is above *M+SD* .

THE METHOD OF ANALYSIS

This research used telephone surveys to collect data and Statistical Package for the Social Science — SPSS PC+, version 4.0 (Norusis, 1988) to analyze the data. The statistical methods for this analysis were as follows:

1. Frequency: Analyzed the uses of cellular among adopters.
2. Crosstabs: Tested the relations between cellular adoption and demographic variables, task attributes, past experiences, sources of cellular knowledge, and uses of telephones.
3. Pearson Product-moment Correlation: Tested the relationship between the

usage of mobile communications and the level of knowledge about cellular.

RELIABILITY AND VALIDITY

Validity and reliability were tested through factor analysis and "reliability" programs. These are available in SPSS PC+.

The validity of the concept "importance of interpersonal contacts" was analyzed by principal components (PC) analysis without rotation, because only one factor was extracted (See Table 3-3). In this scale, three items had relatively reliable factor loading and communality; in addition they were significantly correlated to one another.

Table 3-3

Factor Analysis of Importance of Interpersonal Contacts

Interpersonal contacts	Eigenvalue	factor loading	commu-nality	correlation matrix 1	2	3
	2.24					
1. Discuss cellular service		.88	.77	--		
2. Discuss cellular equipment		.92	.85	.76***	--	
3. Accept suggestions		.79	.62	.49***	.60***	--

N =70.
Pct of Variance =74.7%.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

The second scale, "task attributes," was extracted in the criteria of two factors by PC analysis with varimax rotation (See Table 3-4). The first factor extracted was "dealing with others," then the "autonomy" attribute. All values in these two factors seemed reliable. In the category of autonomy, the two items were phrased as opposites, so they were negatively correlated.

Table 3-4

Factor Analysis of Task Attributes

	Eigenvalue	factor loading	commu-nality	correlation matrix 1	2
Deal	1.75				
1. Work with others		.88	.80	--	
2. Deal with others		.87	.78	.60***	--
Autonomy	1.32				
1. Supervised		-.78	.73	--	
2. Work alone		.83	.76	-.30***	--

N =130.
Pct of Variance: 76.7%= 43.7% (Deal) + 32.9% (Autonomy).
*$p < .05$. **$p < .01$. ***$p < .001$.

The reliabilities of the importance of interpersonal contacts, and task attributes were analyzed by Cronbach's alpha. The original idea of the "importance of interpersonal contacts" comes from Hershey et al. (1978). Questions about the "importance of interpersonal contacts" in the present study were written by the researcher. It was necessary to test the reliability of this

scale, and it was shown to be reliable (alpha = .82).

The "task attributes" scale originated in a psychological study by Sims et al. (1976). The scale has been tested for reliability and validity against several professions in previous studies. "Autonomy" (alpha = .74) and "dealing with others" (alpha = .75) reported above the 0.70 reliability level (Sims et al., 1976, p. 203, & 209). In this project, the test of reliability for "dealing with others" stayed the same (alpha = .75), while "autonomy" achieved an unreliable value (alpha = .42, see Table 3-5).

Table 3-5

The Reliability Analysis of Scales

	Alpha	*N* of cases
Importance of interpersonal contacts	.82	70
Task attributes		
1. Deal with others	.75	130
2. Autonomy	.42	130

Note. The "autonomy" attribute is not reliable.

CHAPTER IV

RESULTS

RESPONDENT CHARACTERISTICS

According to the survey, a general description of the 130 valid respondents is as follows:

1. Sex:

In the 130 valid samples, there were one hundred males and thirty females. The goal was to reach only main users of cellular telephone and residential lines, and these tended to be males (See Table 4-1). This was even more true of cellular adopters (92.3% males).

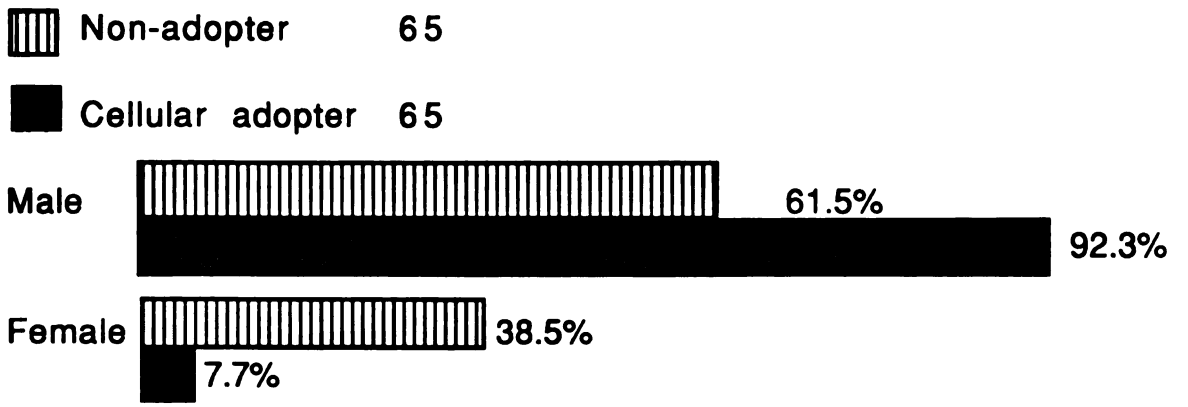
Table 4-1

Crosstabs Between Sex and Cellular Adoption

Count Row Pct	Male	Female	Row Total
Non Adopt	40 61.5	25 38.5	65 50.0
Adopt	60 92.3	5 7.7	65 50.0
Column Total	100 76.9	30 23.1	130 100.0

χ^2 (1, N = 130) = 15.64, $p < .001$.

Figure 4-1. Percentage of Sex on Cellular Adoption.



2. Age:

As expected, the middle age group (31-40) formed the majority of cellular adopters (53.8%). The differences between adopters and non-adopters seemed to come mainly from the group 18-24 (4.6% to 10.8%) and the group 51+ (1.5% to 16.9%). In short, it could be said that the oldest and the youngest segments of the population did not adopt cellular telephones in the same volume as the middle age group, but the statistics (X^2) was not significant.

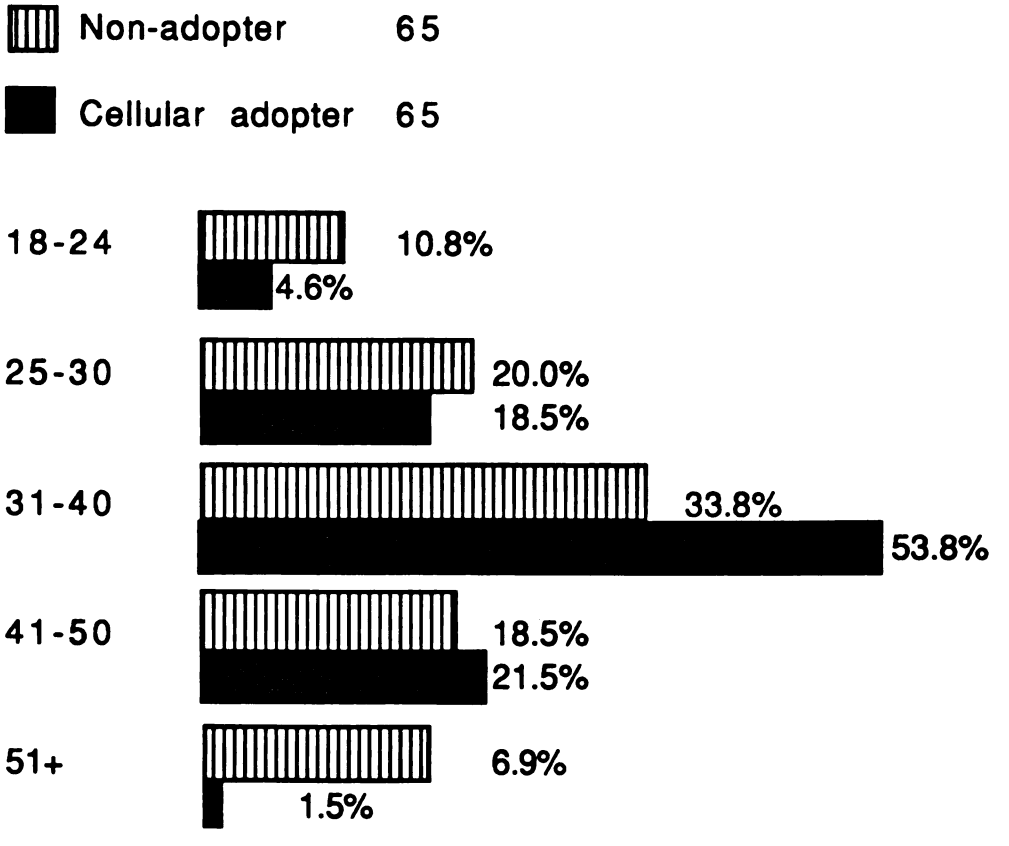
Table 4-2

Crosstabs Between Age and Cellular Adoption

Count Row Pct	18-30	31-40	40+	Row Total
Non Adopt	20 30.8	22 33.8	23 35.4	65 50.0
Adopt	15 23.1	35 53.8	15 23.1	65 50.0
Column Total	35 26.9	57 43.8	38 29.2	130 100.0

X^2 (2, N = 130) = 5.36, $p > .05$.

Figure 4-2. Age of Cellular Adopters.



3. Education level:

Most of the subjects were college educated (43.4%). This education level was expected; Taiwan requires all citizens to attend school through the ninth grade. However, among sixty-four of the cellular adopters (as opposed to fixed telephone users), the percentage with a college education dropped slightly (46.2% non-adopters to 40.6% adopters), while the percentage of high school graduates increased among cellular adopters (26.2% non-adopters to 32.8% adopters). There was also a slight decrease in the junior high level of education (27.7% non-adopters to 21.9% adopters). Other cellular adopters included one who was uneducated and two with advanced degrees. However, this result was not significant.

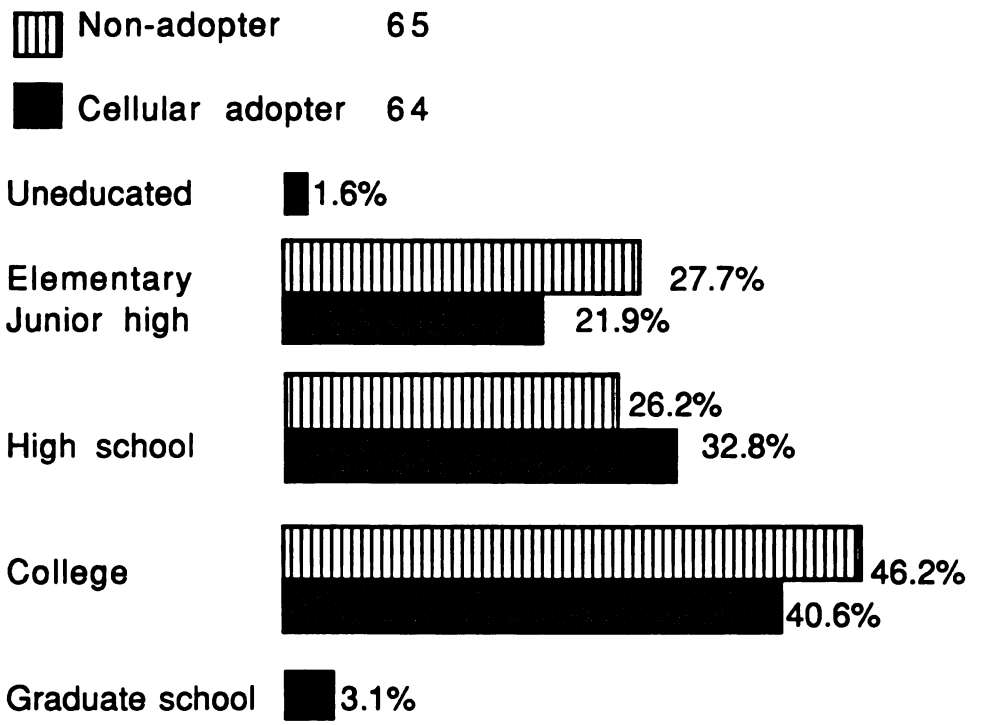
Table 4-3

Crosstabs Between Education and Cellular Adoption

Count Row Pct	Uneducated Elementary	High School Jr-High	College Graduate	Row Total
Non Adopt	18 27.7	17 26.2	30 46.2	65 50.4
Adopt	15 23.5	21 32.8	28 43.7	64 49.6
Column Total	33 30.0	38 22.3	58 47.7	129 100.0

X^2 (2, N = 129) = .76, $p > .05$.

Figure 4-3. Percentage of Education on Cellular Adoption.



4. Monthly income:

Despite their slightly lower level of education than non-adopters, cellular adopters enjoyed a significantly higher income level. While the vast majority of cellular adopters were in the highest income category (NT $50,001+), non -adopters tended to be in the lowest (NT $20,000-). The difference may have been partially due to the cost of a cellular telephone in Taiwan. The researcher concludes that even with a monthly income of NT $50,000, the cost of a cellular telephone would be difficult to afford.

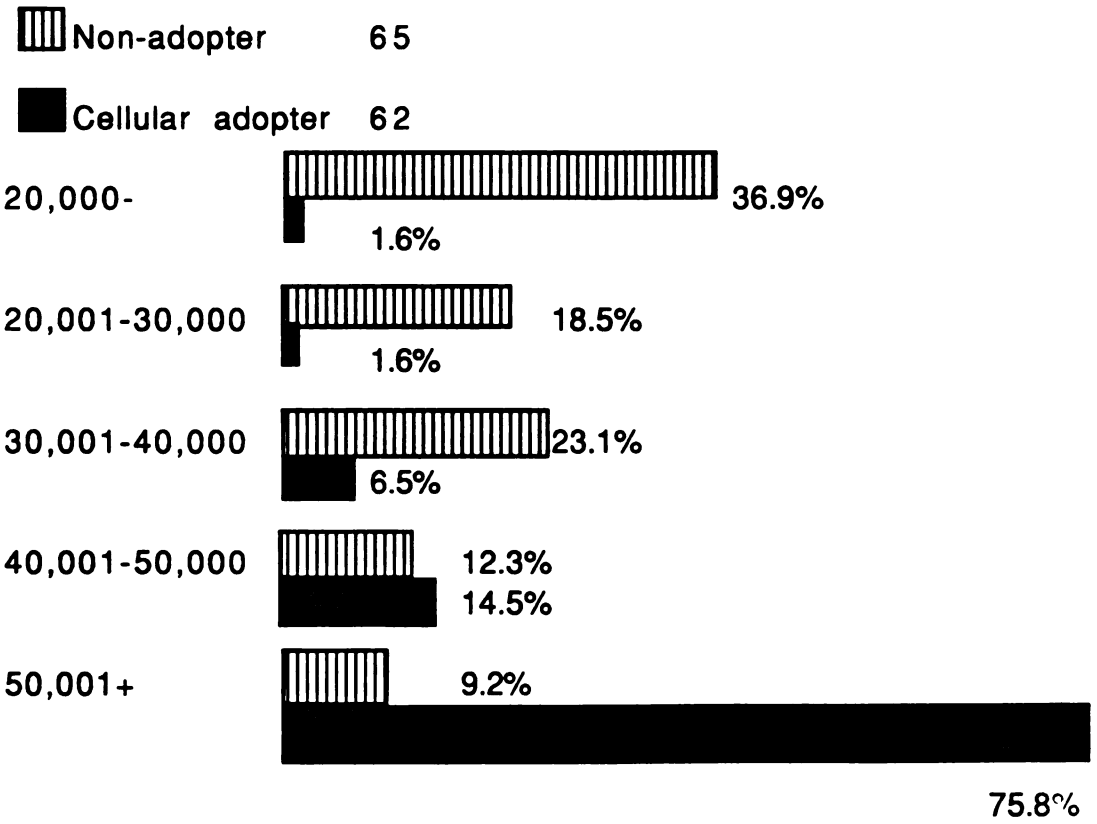
Table 4-4

Crosstabs Between Monthly Income and Cellular Adoption

Count Row Pct	40,000- 	40,000 — 50,000	50,001+ 	Row Total
Non Adopt	51 78.5	8 12.3	6 9.2	65 51.2
Adopt	6 9.7	9 14.5	47 75.8	62 48.8
Column Total	57 44.9	17 13.4	53 41.7	127 100.0

X^2 (2, N = 127) = 67.27, p <.001.

Figure 4-4. Percentage of Monthly Income on Cellular Adoption.



5. Profession:

To analyze qualitatively, the researcher defined five levels of professions combining work place and job title. Forty percent of cellular adopters were grouped as "high level professionals or top executives," followed by 36.9 percent in the "professionals or superior executives" group. Most cellular adopters were the heads of businesses, either of small companies or large companies (less or more than ten employees). Most non-adopters aggregated in the "unskilled workers" group (34.9%), followed by the middle (25.4%), then middle-high (23.8%) level of professionals.

One adopter was a student. She was given a cellular telephone by her father after she had used a pager and a mobile phone. In this case, the profile showed unusual results: an unemployed cellular adopter.

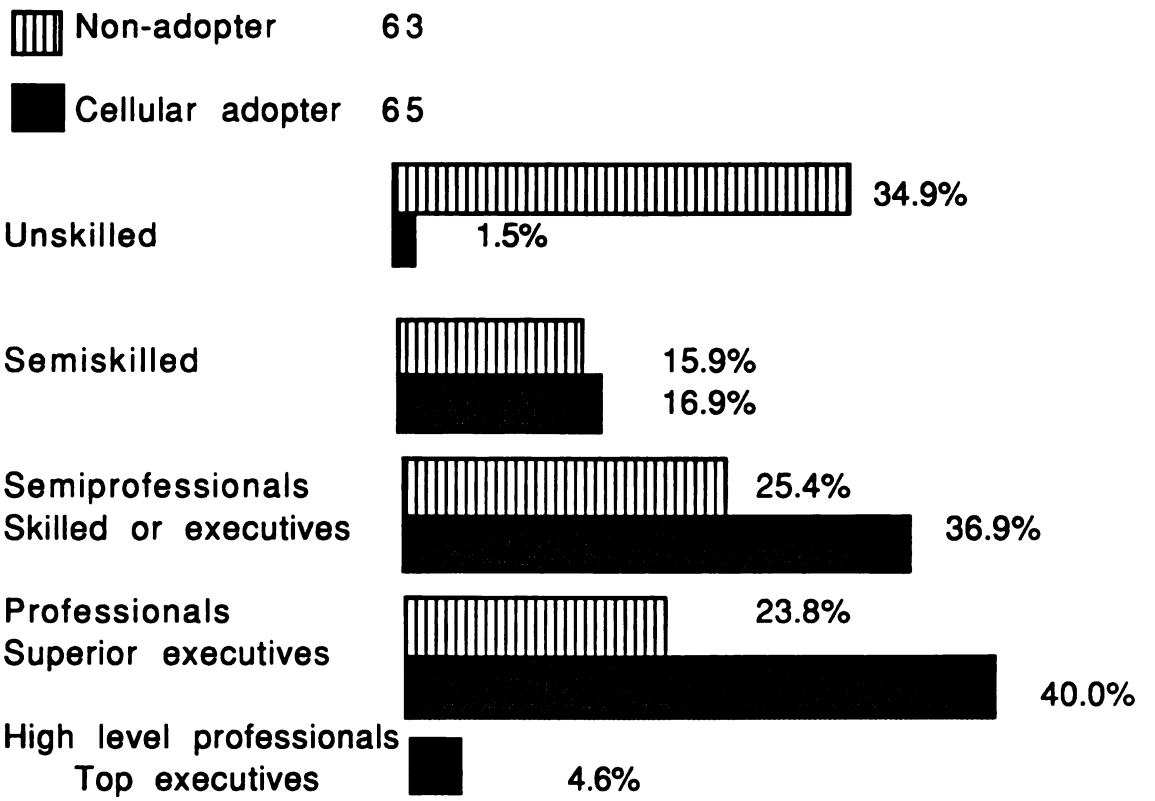
Table 4-5

Crosstabs Between Professions and Cellular Adoption

Count Row Pct	Unskilled Semiskilled	Semipro Skilled	Pro Top Execut Executive	Row Total Superior
Non Adopt	32 50.8	16 25.4	15 23.8	63 49.2
Adopt	12 18.4	24 36.9	29 44.6	65 50.8
Column Total	44 34.4	40 31.2	44 34.4	128 100.0

X^2 (2, N = 128) = 15.12, $p < .001$.

Figure 4-5. Percentage of Professions on Cellular Adoption.



A DESCRIPTION OF CELLULAR USE IN TAIWAN

Cellular technology became available in Taiwan, July 1989. By the time the researcher conducted this survey, cellular telephones had been in use for only eighteen months. Most adopters (78.5%) had started using cellular telephone within the last six months (See Figure 4-6). According to the social diffusion of innovation theory, the Taiwanese cellular market was too new to define a reasonable distribution of adopter types. The subjects surveyed probably only represented the early adoption stage.

Though the cellular market was new, the consumption of cellular telephone was greater than expected. More than half of adopters (50.8%) used their cellular telephones over sixty-one times a week (See Figure 4-7). Adopters chose cellular telephones mainly for business purposes (49.6%), or for personal convenience and time saving (41.7%) (See Figure 4-8). The greater percentage of using cellular telephones in business seems a result of work requirements. Thus work requirements would be the best incentive to promote the needs of cellular telephones.

The most popular channel through which subjects learned about cellular was interpersonal contacts (62.7%) (See Figure 4-9). Newspapers were second (17.3%), then television (10.7%). The majority of adopters learned about cellular from friends. In Hung's study (1988), mobile telephone adopters were influenced most by salesperson. Yet in this research, sales agents (5.3%) offered less cellular information than did mass media.

Figure 4-6. Time of Using Cellular Telephone.

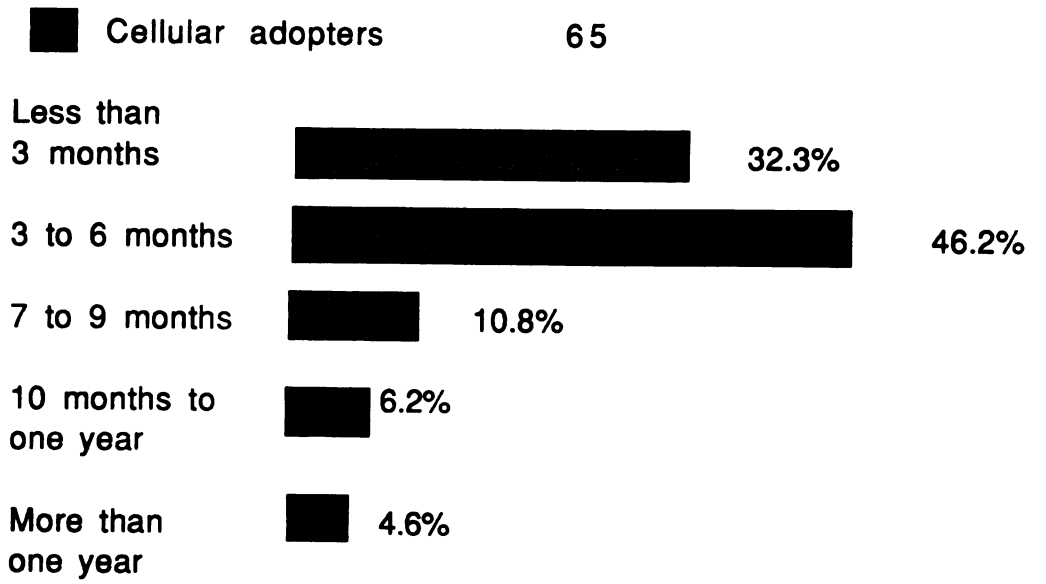


Figure 4-7. Usage of Cellular Telephone.

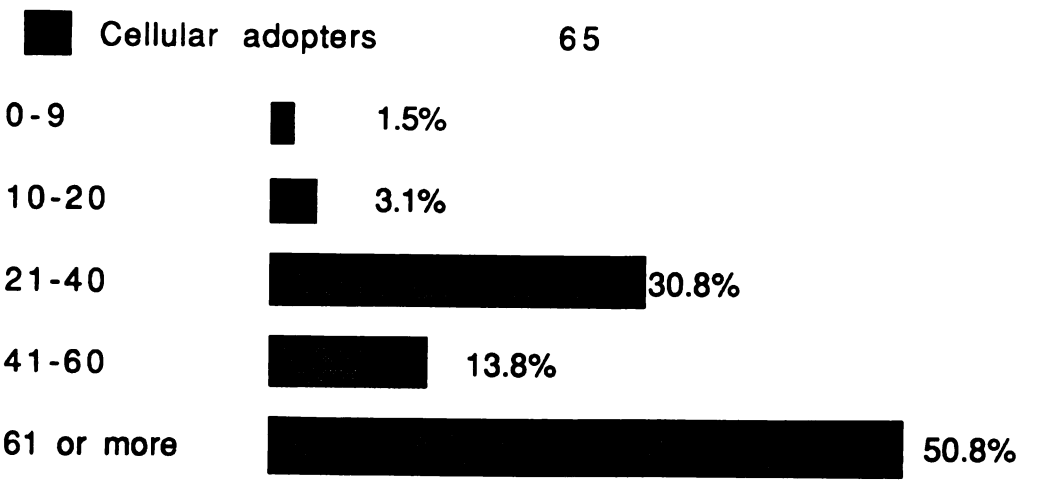


Figure 4-8. Reasons to Use Cellular Telephone.

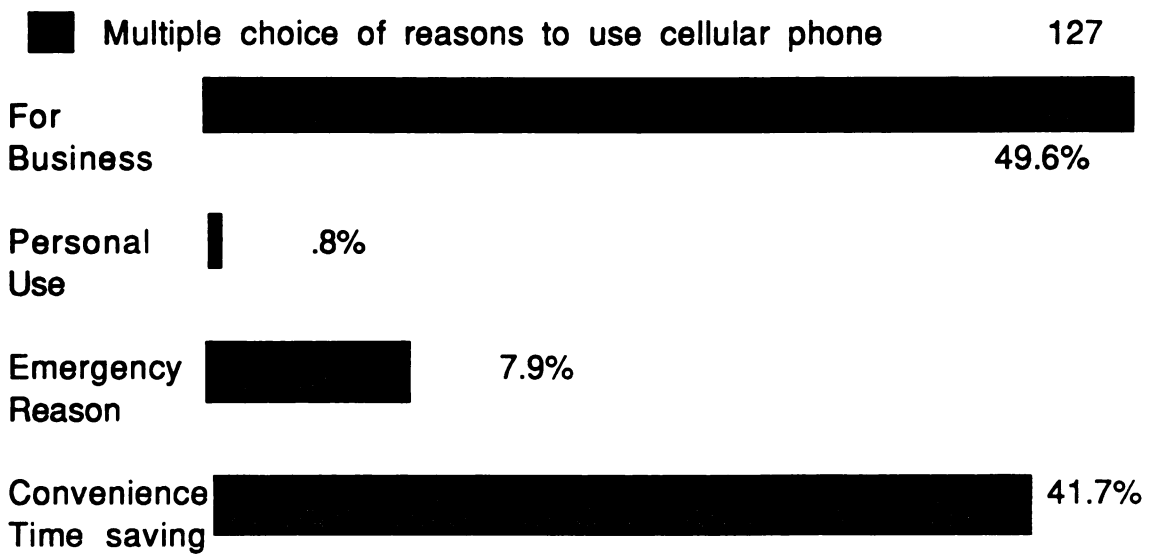
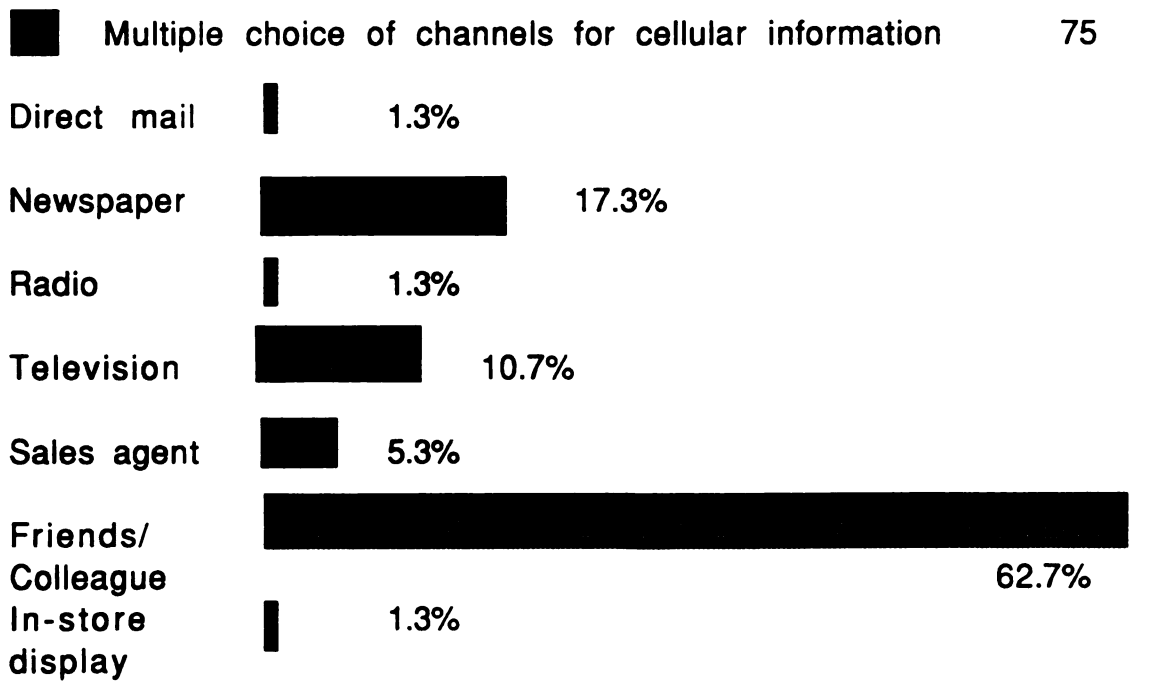


Figure 4-9. Channels to Know About Cellular Telephone.



COMPATIBILITY OF CELLULAR WITH ADOPTION

Task Attributes and Adoption of Cellular Telephone

The results did not show that cellular adopters reported more autonomy than non-adopters (See Table 4-6): it did not reach the significance of 0.05. The first hypothesis, persons with a high level of autonomy at work would adopt cellular telephones, was rejected (X^2 (2, N = 130) = .06, p > .05). This rejected hypothesis might be affected by the low "reliability" (alpha = .42) of the "autonomy."

Table 4-6

Crosstabs Between "Autonomy" and Cellular Adoption

Count Row Pct Clo Pct	Lo	Mi	Hi	Row Total
Non Adopt	20 30.8 51.3	14 21.5 48.3	31 47.7 50.0	65 50.0
Adopt	19 29.2 48.7	15 23.1 51.7	31 47.7 50.0	65 50.0
Column Total	39 30.0	29 22.3	62 47.7	130 100.0

X^2 (2, N = 130) = .06, p > .05.

On the other hand, cellular adopters did report having more opportunities to deal with others (See Table 4-7). Adopters were more likely in the middle

and high levels (76.9%) of "dealing" opportunities while 61.5 percent of non-adopters were in the low level. The second hypothesis, persons with a high level of dealing with people would adopt cellular telephones, was therefore accepted (X^2 (2, N = 130) = 31.22, p < .001).

Table 4-7

Crosstabs Between "Deal with Others" and Cellular Adoption

Count Row Pct Clo Pct	Lo	Mi	Hi	Row Total
Non Adopt	40 61.5 72.7	6 9.2 15.0	19 29.2 54.3	65 50.0
Adopt	15 23.1 48.7	34 52.3 51.7	16 24.6 50.0	65 50.0
Column Total	55 42.3	40 30.8	35 25.9	130 100.0

X^2 (2, N = 130) = 31.22, p < .001.

Past Experiences With Uses of Cellular Telephone

Seventy-five percent of cellular adopters had mobile communication experiences, of either pagers, mobile telephones or citizen band radios (X^2 (2, N = 130) = 43.77, p < .001, see Table 4-8). It became popular for cellular adopters to use pagers at the same time (70.7%). Nearly one person in three carried a pager in the Taipei District (DGT, March 1991). On the other hand,

only 18.4 percent of non-adopters had been using mobile communications.

Figure 4-10. Type of Mobile Communications.

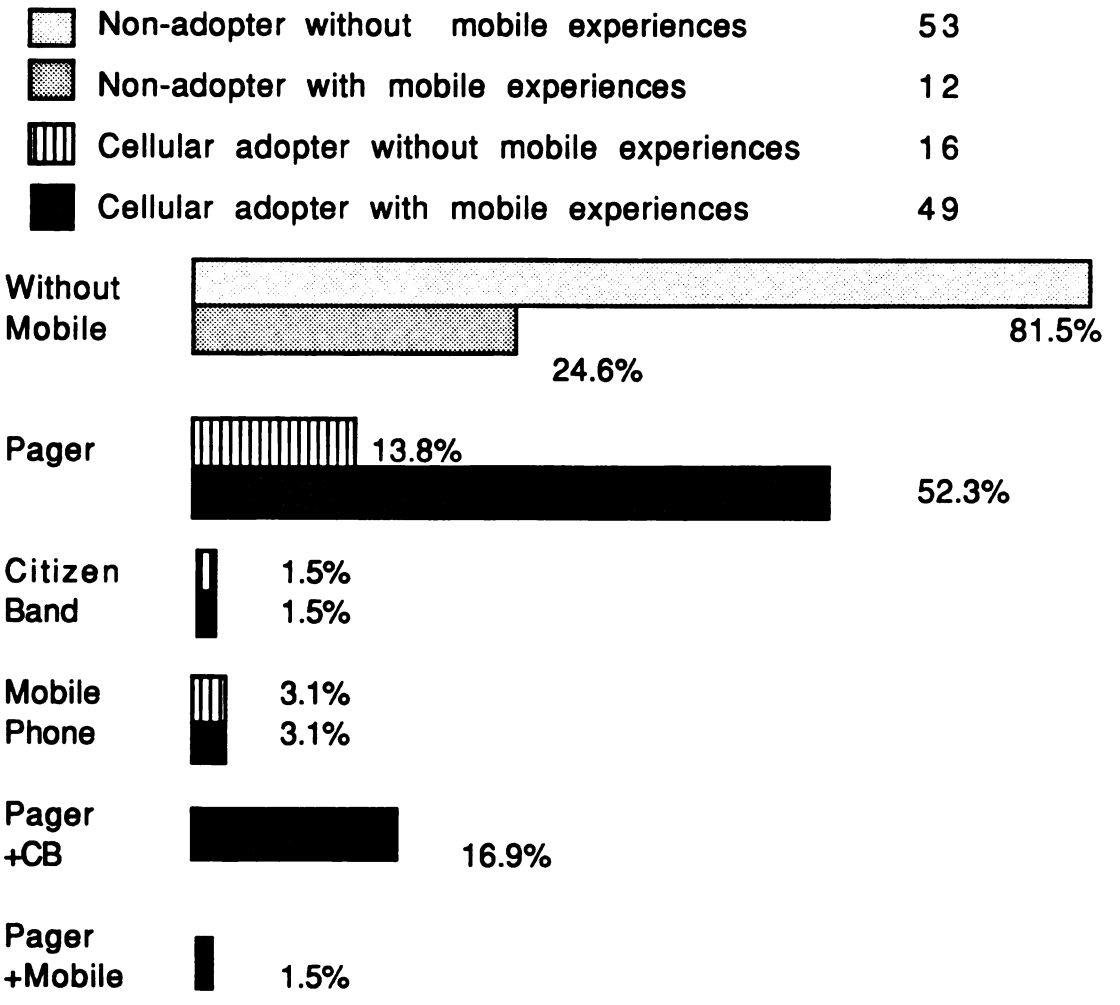


Table 4-8

Crosstabs Between Mobile Communications and Cellular Adoption

Count Row Pct Clo Pct	None	Pager	Others	Row Total
Non Adopt	53 81.5 76.8	9 13.8 20.9	3 4.6 16.7	65 50.0
Adopt	16 24.6 23.2	34 52.3 79.1	15 23.1 83.3	65 50.0
Column Total	69 53.1	43 33.1	18 13.8	130 100.0

X^2 (2, N = 130) = 43.77, p < .001.
Note. Adjusted: X^2 (1, N = 130) = 41.37, p < .001.

Cellular adopters (84.6%) were more likely to use fixed telephones heavily (X^2 (1, N = 130) = 74.16, p < .001, see Table 4-9). Furthermore, over half of them (72.3%) used mobile communications more frequently than did non-adopters (See Table 4-10). The subjects were asked directly "If having experience with mobile communications made them more likely to use cellular telephone?" The cellular adopters (67.7%) generally agreed, while 86.2 percent of non-adopters disagreed (See Table 4-11).

Therefore, this researcher concluded that cellular adopters were frequent mobile communication users (X^2 (1, N = 130) = 40.34, p < .001). Past experiences with mobile communication resulted in an increased likelihood of

cellular adoption (X^2 (1, N = 130) = 39.02, p < .001). Thus the third hypothesis, persons who had past experiences with mobile communications would be more likely to adopt cellular telephones, was accepted.

Table 4-9

Crosstabs Between the Usage of Fixed Phone and Cellular Adoption

Count Row Pct Clo Pct	Lo	Hi	Row Total
Non Adopt	59 90.8 85.5	6 9.2 9.8	65 50.0
Adopt	10 15.4 14.5	55 84.6 90.2	65 50.0
Column Total	69 53.1	61 46.9	130 100.0

X^2 (1, N = 130) = 74.16, p < .001.

Table 4-10

Crosstabs Between the Usage of Mobile Communication and Cellular Adoption

Count Row Pct Clo Pct	Lo	Hi	Row Total
Non Adopt	54 83.1 75.0	11 16.9 19.0	65 50.0
Adopt	18 27.7 25.0	47 72.3 81.0	65 50.0
Column Total	72 55.4	58 44.6	130 100.0

X^2 (1, N = 130) = 40.34, p < .001.

Table 4-11

Crosstabs Between the Likelihood of Using Cellular and Cellular Adoption

Count Row Pct Clo Pct	Lo	Hi	Row Total
Non Adopt	56 86.2 72.7	9 13.8 17.0	65 50.0
Adopt	21 32.3 27.3	44 67.7 83.0	65 50.0
Column Total	77 59.2	53 40.8	130 100.0

X^2 (1, N = 130) = 39.02, p < .001.

As a result, the person with mobile communication experience would likely know more about cellular than the person without. Due to past experiences, the mobile user has a greater likelihood of upgrading to cellular service. The Pearson product-moment correlation revealed a moderate relation between using mobile communications and the level of knowledge about cellular. The result supported the fourth hypothesis (r (130) = .20, $p < .05$). The more frequently a person used mobile communications, the more he or she knew about cellular telephone.

CELLULAR KNOWLEDGE AND ADOPTION

About seventy percent of cellular adopters acquired cellular knowledge through interpersonal channels, mostly friends (See Table 4-12). Only around 9.2 percent of cellular adopters reported receiving cellular information through mass media channels, and 12.3 percent reported receiving information through both channels.

On the other hand, 44.6 percent of non-adopters knew nothing about cellular telephone. The rest gained their knowledge through both Interpersonal (26.2%) and mass media (23.1%) channels. It was more likely that cellular adopters knew about cellular through interpersonal channels. The fifth hypothesis, adopters would be more likely to become aware of cellular from mass media channels, was rejected (X^2 (3, N = 130) = 30.59, $p < .001$).

Figure 4-11. Sources of Cellular Information.

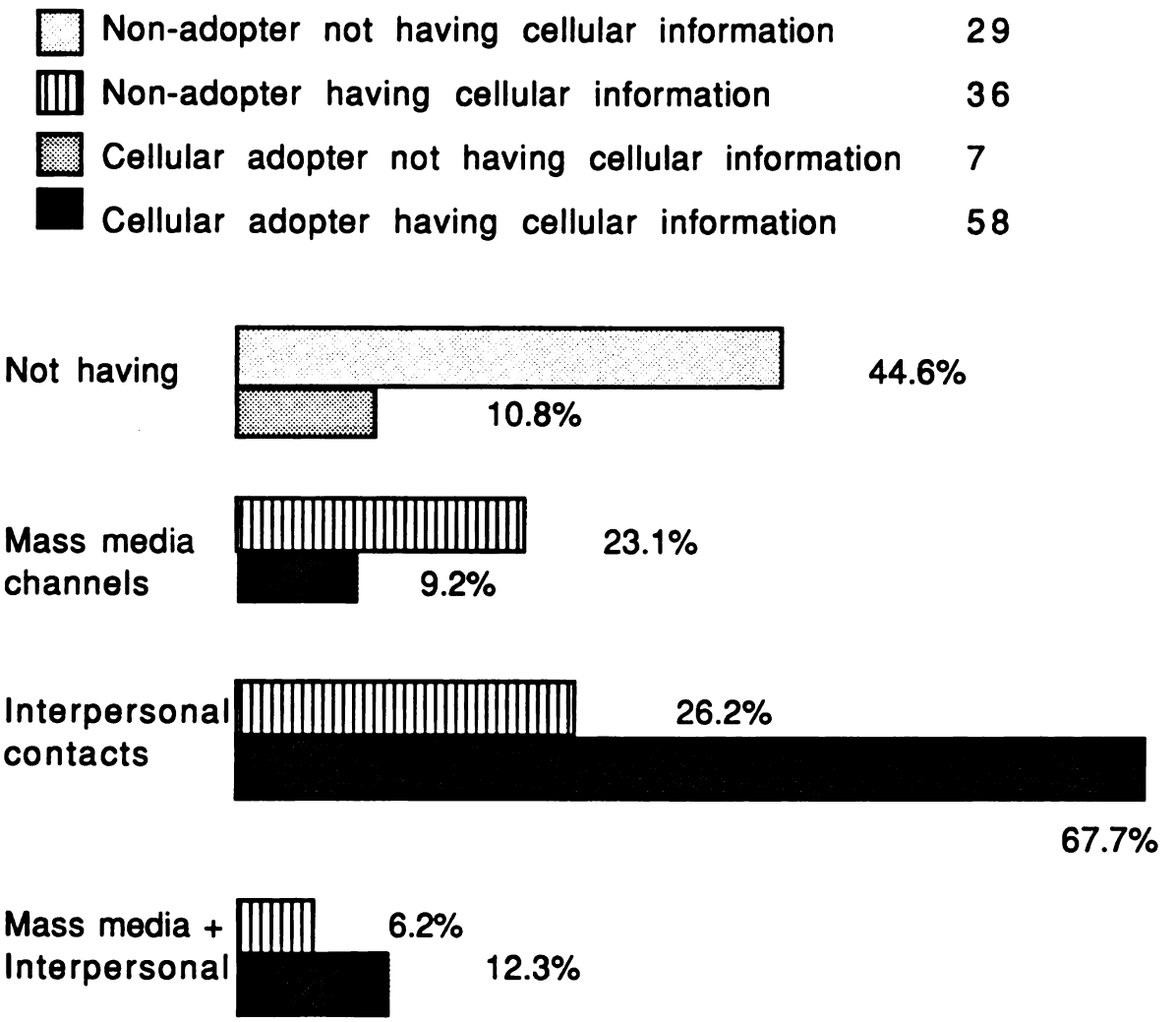


Table 4-12

Crosstabs Between Information Channels and Cellular Adoption

Count Row Pct Clo Pct	None	Mass	Inter	Mass+Inter	Row Total
Non Adopt	29 44.6 80.6	15 23.1 71.4	17 26.2 27.9	4 6.2 33.3	65 50.0
Adopt	7 10.8 19.4	6 9.2 28.6	44 67.7 72.1	8 12.3 66.7	65 50.0
Column Total	36 27.7	21 16.2	61 46.9	12 9.2	130 100.0

X^2 (3, N = 130) = 30.59, p < .001.

Note. Adjusted: X^2 (2, N = 130) = 30.47, p < .001.

Concerning the level of cellular knowledge (See Table 4-13), adopters (80.0%) aggregated at the middle level. At the low level of cellular knowledge there were more non-adopters (82.1%) than adopters. Thus, it was more likely that adopters were more knowledgeable about cellular than non-adopters (X^2 (2, N = 130) = 23.32, p < .001), as we might expect. However, when the survey asked how important it was to get information before deciding on the adoption of cellular telephone, non-adopters thought it more important than adopters.

Table 4-13

Crosstabs Between Knowledge Level and Cellular Adoption

Count Row Pct Clo Pct	Lo	Mi	Hi	Row Total
Non Adopt	32 49.2 82.1	28 43.1 35.0	5 7.7 45.5	65 50.0
Adopt	7 10.8 17.9	52 80.0 65.0	6 9.2 54.5	65 50.0
Column Total	39 30.0	80 61.5	11 8.5	130 100.0

X^2 (2, N = 130) = 23.32, p < .001.

There were 91.7 percent of non-adopters rated highly the "importance of mass media messages" about cellular. Most adopters (93.3%), however, placed this at the low level of importance (See Table 4-14). Table 4-14 was only used for demonstration because one cell of the table did not fulfill a necessary criterion of the chi-square (it included less than five expected frequencies). As for interpersonal contacts, nearly eighty percent of adopters (78.8%) aggregated at the low level of importance as well (X^2 (1, N = 70) = 7.54, p < .01, see Table 4-15). In sum, when it came to making an adoption decision, knowledge about cellular either by mass media or interpersonal contacts was not necessarily important. Therefore, the sixth hypothesis, adopters would be more likely to perceive information gained through mass media channels as

important, was rejected (X^2 (1, N = 32) = 11.45, p < .001).

Table 4-14

Crosstabs Between the Importance of Mass Media and Cellular Adoption

Count Row Pct Clo Pct	Lo	Hi	Row Total
Non Adopt	6 35.3 30.0	11 64.7 91.7	17 53.1
Adopt	14 93.3 70.0	1 6.7 8.3	15 46.9
Column Total	20 62.5	12 37.5	32 100.0

X^2 (1, N = 32) = 11.45, p < .001.

Note. One cell has less than five expected frequencies; this value is not reliable for Chi-square.

Table 4-15

Crosstabs Between the Importance of Interpersonal Contacts and Cellular Adoption

Count Row Pct Clo Pct	Lo	Hi	Row Total
Non Adopt	8 44.4 16.3	10 55.6 47.6	18 25.7
Adopt	41 78.8 83.7	11 21.2 52.4	52 74.3
Column Total	49 70.0	21 30.0	70 100.0

X^2 (1, N = 70) = 7.54, $p < .01$.

SUMMARY OF RESULTS

Data analysis revealed the following results.

1. Cellular adopters were more likely to be males; in their thirties; college educated; with high incomes; and small or large business owners.
2. Cellular adopters had more opportunities to deal with others than did non-adopters, but did not necessarily have more autonomy in their work.
3. Cellular adopters were more likely to have previous experiences with mobile communications.
4. The more frequently a person used other kinds of mobile communications, the more he or she knew about cellular telephones.
5. Adopters were more likely to receive information about cellular from

interpersonal contacts, mainly friends than from any other source.

6. When choosing cellular telephones, adopters thought it less important to get information or suggestions than non-adopters.

The results showed that the first hypothesis was rejected, because the result did not reach the significant level. Adopters did not have more autonomy than non-adopters at work. The fifth and sixth hypotheses were also rejected. The results were significant but opposite with original hypotheses at statistics. As for the fifth hypothesis, adopters did not become aware of cellular from mass media channels. Instead, they built up their cellular knowledge through interpersonal contacts. The sixth hypothesis was finally formulated as follows: when it came to adoption, adopters thought that cellular knowledge through mass media was less important than did non-adopters. Given the results discussed above, the hypotheses were listed (See Figure 4-12).

Figure 4-12. Results of Hypotheses.

	Independent Variable	Dependent Variable	
H1	Autonomy	Adoption	XX
H2	Deal with Others	Adoption	O
H3	Past Experiences	Adoption	O
H4	Usage of Mobile Comm	Cellular Knowledge Level	O
H5	Knowledge from Mass Media	Adoption	X
H6	Importance of Mass Media	Adoption	X

Note. 1. **"XX"** hypothesis was rejected.
2. **"O"** hypothesis was accepted.
3. **"X"** hypothesis was rejected but reached a significant level in the opposite direction.

CHAPTER V

CONCLUSIONS

SUMMARY

Cellular telephones were used mostly for business purposes. The most important consideration for adoption was the users' perceived needs at work. Cellular adopters had more opportunities to deal with others but not necessarily more autonomy. With more opportunities to deal with others, there was a greater likelihood that they received cellular information from interpersonal channels.

Cellular adopters were generally experienced with other mobile communication technologies, such as pagers, CB radios, and mobile telephones. The more a person depended on other mobile communication technologies, the more information they sought on cellular. Previous experience with other mobile technologies increased both the likelihood and amount of cellular telephone use.

There seemed an inequity of information between adopters and non-adopters. Obviously adopters knew more about cellular than non-adopters and they had a different set of information sources. The adopters were more likely to turn to friends for information while non-adopters were equally likely to seek information either from interpersonal or mass media channels. When adopters were reaching their adoption decisions, prior information was not particularly important to them. On the other hand, non-adopters felt it important to have more information from any channel before adoption.

To summarize, in Taiwan, the majority of cellular adopters were males, from thirty-one to forty years old, and business people with relatively high incomes. Most adopters were college educated. Among those cellular adopters surveyed, most had been using the technology for less than six months. Reasons for adoption were mainly business and personal convenience. The most important task attribute was that the adopters had more opportunities to deal with people. Friends were the most important channel for adopters in receiving cellular information. Finally, past experience determined adoption more than did information seeking.

DISCUSSION

The Taiwanese cellular market has been developing for almost three years. This research showed that 78.5 percent of adopters have been using cellular telephone for less than half a year, 17.0 percent for about one year, and 4.6 percent for more than one year. According to Rogers', there are five classifications of adopters, divided by a normal frequency distribution (Rogers, 1983, p. 246). They are: innovators (2.5%), early adopters (13.5%), early majority (34.0%), late majority (34.0%) and laggards (16.0%).

Based on Rogers' model, in this research, those who have be using cellular telephone for one year or for a half year might be defined as early adopters or early majorities. The innovators probably were those who have been using cellular for more than one year. Thus, if Rogers' theory is correct, the development of the Taiwanese cellular market may still be placed in the

early three categories.

In the NYNEX study, the majority of American subscribers had been using cellular telephone for one or two years (50%) (Yankelovich, 1990). The difference is that cellular technology had been developing for more than ten years in the United States. Compared to the history of the American cellular system, Taiwanese cellular technology seems to have grown too quickly to be well prepared. After only a two-year development, one out of every fifty Taiwanese residents has a cellular telephone.

Moreover, when it comes to cellular telephone usage, Taiwanese adopters make more calls than U.S. cellular owners. The mean (*M*) of calls for U.S. users was twenty times in a week (Yankelovich, 1990). Only 24.0 percent of U.S. users called or received calls over twenty times a week. On the other hand, according to the present study, fifty percent of the surveyed Taiwanese users made over sixty calls weekly.

The DGT has encountered very serious problems constructing of the cellular system. There have been complaints from cellular adopters, and even the Taiwanese president and administrators (Lee, 1990c). There are too few channels to serve the public. This problem stems from the original plan of the cellular system. The intention was to build a linear cell super-highway system; this led to the neglect of the Taipei district. It is a critical time for the researcher to publish this survey.

Further, in Taiwan, mobile radios are in regulatory difficulty. For example, amateur radio is still restricted. Even CB radio is limited to a small

population. These circumstances would explain why mobile users were found most likely to have used radio paging in this research rather than CB. This conflicts with the NABER's study, in which CB radio was most popular (Hershey & Shott, 1978). Apparently, in Taiwan, cellular technology is a hot market because it was introduced when other mobile communication systems were suffering.

The pager is the most popular form of mobile communications in Taiwan. It is convenient for adopters to have both a pager and a cellular system. They can save money and trouble by receiving calls through paging, and make outgoing calls through free channels in a cellular system. Since the function is simpler, the short message on a beep is sent more successfully than cellular calls. The convenience motivates potential adopters to choose this option and allows experienced adopters to confirm their decision to opt for the two technologies. By clustering cellular and paging services, the adopters gain economic benefit out of the innovation. The cost of a single transmission on a pager is cheaper than its cost on a cellular telephone. These are examples of "compatibility" of other technology use through the adoption of cellular telephone.

Diffusion of innovation theory has been partially supported by this project. This research concentrated on the "compatibility" attribute of innovation, including past experience and task attributes. The results identified the compatibility of cellular telephones.

In order to perform his or her work satisfactory, an individual may be

encouraged to adopt an innovation to meet clients' or coworkers' requirements. The perceived need for cellular communication at work seems to be the most important factor affecting adoption. According to these results, cellular adopters had more opportunities to deal with others but not necessarily more autonomy.

Most cellular adopters need to be in touch (or in better touch) with their businesses while on the road. The cellular telephone can be a useful device for communication wherever the business is. The "dealing with others" attribute at work records the opportunities to communicate. The presence of opportunities to deal with others increases the compatibility of cellular adoption. Moreover, in this research, the adopters used cellular telephones mainly for business. This research result indicated that cellular was an innovative technology compatible with adopters' lifestyles.

The results of this research provided support for the idea that past experiences of mobile communications could increase the adoption rate for cellular telephone: diffusion theory suggests that media experiences and skills formed in the past affect the adoption of later technology. Rogers also mentioned that innovation adopters have tended toward clusters of technologies. In this research, more than half of the adopters (52.3%) used pagers along with cellular telephones. Moreover, the present research uncovered the fact that frequent mobile communicators would seek information about cellular telephone.

To decide or confirm an adoption, the (potential) adopters sought information about cellular telephony to decrease their uncertainty about the

innovation. In this research, the adopters received knowledge about cellular mainly from friends. Nearly seventy percent of adopters (See Table 4-12) sought advice from interpersonal contacts. However, adopters reported that information was not an important factor when it came to innovation adoption. In other words, the adopters receive information but they might not be affected by it. This finding supports diffusion theory's contention that early adopters are highly exposed to an interpersonal network but not dependent on it. This research showed evidence that adopters were not persuaded by interpersonal contacts.

Furthermore, the result did not support Rogers' comment about the effects of mass media on the early adopters. They were not exposed to mass media as much as Rogers predicts (Rogers, 1986, p. 134), and the mass media were not so important to the early adopter. Here, the media widely informed the public and formed their awareness of cellular technology, yet Rogers (1983, p. 170) also referred: the mass media messages were too general to provide the specific kind of reinforcement towards cellular adoption.

The present research confirms that mass messages were not important in affecting cellular adoptions, though the chi-square missed a criterion (there was only one adopters in the high importance of mass media, see Table 4-14). This result may be created by leaving out the trade publications on the list of the question which asked how the subjects learned about cellular technology. Trade and professional magazines, as elite media, probably have more

credibility and offers better knowledge about cellular than the other mass media.

Since cellular adopters enjoy high incomes, they travel abroad. Three respondents stressed specifically that they gained cellular information in foreign countries, those which have already developed cellular systems, such as Hong Kong, Japan, or the United States. These adopters sought information sources from abroad. Knowledge acquisition was a necessary but not sufficient factor in affecting adoptions.

In summary, (1) past experiences with mobile communication and (2) a perceived need for such communication at work served important roles in cellular adoption. Those two variables increased the compatibility of cellular telephones. Adopters sought information about cellular mainly through interpersonal contacts, but this information did not affect their adoptions of cellular telephones. In the comparison with adopters, non-adopters knew less about cellular. Yet, they thought the information more important, if they were to decide to adopt cellular telephones.

LIMITATIONS

The method for sampling cellular adopters was different from the one used for fixed telephone subjects. Originally, the researcher intended to sample cellular adopters from a subscriber list: this plan did not work out because of problems with DGT. By the time it became impossible to obtain the DGT list of cellular subscribers, the survey of regular users was already completed. There

was no time for additional interviews. Therefore, adopters were sampled by random digit dialing, while non-adopters were drawn from a telephone directory sampling.

The directory sampling method used for fixed telephone users did not include unlisted people. In Taiwan, 18.85 percent of fixed telephone users are unlisted subscribers. Since there is no official description to identify the unlisted subscribers, this researcher interviewed the director (Mr. Yang) of Public Relations Department in the DGT. The most significant characteristic of the unlisted subscriber is those with high visibility (more than half of unlisted subscribers): they are often movie stars, singers, the heads of top financial groups, or politicians (DGT record, March 1992). The second group most likely to be unlisted is Doctors, the third is Illegal business persons, e.g., loan sharks, and commodity brokers and unlicensed stock brokers. Logically, the rest would be people with high income, or those wishing greater privacy. Since these persons were unlisted in the telephone directory, they were not included in the non-adopters' sample. This was another limitation in this research.

The results of this research might have changed had the unlisted population been surveyed. According to the characteristics described above, unlisted fixed telephone subscribers may enjoy a high income, similar to cellular adopters. Since the professions of unlisted subscribers often require mobility, these professionals are likely to use mobile devices, including cellular telephones. In other words, the unlisted may have the same backgrounds as cellular adopters. The gaps between cellular adopters and non-adopters might

appear larger because the telephone directory sampling did not include the unlisted.

Concerning the telephone directory sampling, another limitation appeared. The researcher intended to reach more main users in the residential lines, so the non-adopters were surveyed during the time when they were off work and at home. On the other hand, the cellular adopters were interviewed during their working period. The time difference of interviews between adopters and non-adopters might create biases on their answers, especially when they were questioned about "task characteristics," usage or business purposes of cellular (fixed) telephones.

One of the unavoidable limitations to almost any survey is the necessarily retrospective self-report. Subjects were asked to recall the adoption process, experiences with mobile communications, and uses of fixed or cellular telephones. Retrospection may be altered by selective exposure, perception, and retention. In this research, the interviews may record individual biases, memory shortages, or exaggerations.

The last limitation was a language barrier. This project was undertaken because there had been no prior cellular telecommunication study in Taiwan. An American university — Michigan State University — supported this study. Most literature and studies in this area of research originated in the United States as well. The approved questionnaires were written in English but had to be translated into Chinese. Translation may sometime affect the original meaning.

From country to country, cultural differences are obstacles. For example, the question "To what extent do you receive information from your superior on your job performance?" Taiwanese respondents might give the answer "fair amount" instead of "very much," simply to avoid "losing face."

The response rate of telephone surveys shows great differences between Taiwan and United States. People's openness to a survey depends on educational, economic, and social background. On average, Taiwanese living in cities have better education and living standards than those living in rural areas. In Taiwan, cooperation in metropolitan areas is greater than that in rural areas. The opposite is true in the United States. For example, cooperation in recent interviews by the Bureau of the Census was seventy percent in the largest metropolitan areas. It was ninety-five percent in small towns and on farms (Rossi, 1983, p. 173).

In a study of satisfaction with fixed telephone service conducted by the Public Opinion Investigation Foundation, Taipei (Tsai, 1991a), the response rate reached 82.3 percent. In my study, fixed telephone subjects had a response rate 77.4 percent and cellular subjects a rate of 89.0 percent. At the same time, another project in a rural area had a response rate of 47.1 percent. The second survey, dealing with politics, may have asked more sensitive questions of subjects, but, the lower cooperation was more likely caused by low education levels in that rural area.

IMPLICATIONS AND RECOMMENDATIONS

In the view of this study's findings, a few recommendations concerning Taiwanese mobile communications are possible.

Besides flaws in the original design of Taiwanese cellular system, the lack of efficient construction techniques is a serious problem. The shortage of an adequate number of channels became evident In the course of this research. Interviewers often received specific pre-recorded messages as to why their calls could not be completed. These messages reported "not in service" (disconnected), "out of service area," or "this call can not get through at this moment, please try later," while the busy lines showed a series of beeps. As a result, more than half of calls (50.68% = 75/148) failed to get through (disregarding disconnected numbers — a normal result of random digit dialing).

When the subjects were asked about the emergency use of cellular telephones, some of them mentioned that their cellular phones could not connect to emergency lines. Those adopters actually thought that they would use cellular telephones for emergency purposes, e.g., police, or ambulance assistance. Surprisingly, the Taiwanese cellular system is not yet connected with emergency services.

According to the results of this study, most adopters reported they knew a great deal about cellular and the information came mainly from friends. Interpersonal contacts are direct but people risk receiving incorrect information. One friend transmits information to another; like a rolling snow ball, as it becomes bigger and bigger, it loses its original shape.

To this point, the researcher believes that mass media messages have the function of cultivating the public in the right direction. In Taiwan, the mass media disseminates too little and too superficial information about cellular. Based the results of this research, most mass messages came from newspapers (17.3%) and television (10.7%) (See Figure 4-9). According to informal content analysis of newspapers, these messages mentioned the costs of cellular equipment, complaints about cellular telephone, construction technology, overloaded channels, and the social effects of cellular telephone.

In general, the messages in newspapers and televisions might not provide adequate information to convince (potential) adopters, who, on the other hand, may not trust the media. Magazines, an elite medium, may offer knowledge which an innovator needs before adoption. Yet none of our respondents volunteered that they had come across cellular knowledge from magazines, however, the survey did not ask them specifically if they had used magazines or if magazines was an important source of information.

Taiwanese magazines may be a good source for developing a foundation of cellular knowledge among adopters. According to the DGT research, the business and management magazines were in the third most likely place to attract to potential cellular adopters. If cellular telephones are defined for business use, business and management magazines may be willing to accommodate content about cellular. Perhaps magazines will increase the credibility of mass media and positively affect cellular adoption. The category "magazines" may prove fruitful for the research on mass media channels of

communication for cellular technology in the future, and should be included in future studies.

One excellent way for the DGT to educate the public is through direct mail (DM). For instance, Michigan Bell provides information on telecommunication issues with every month's bill. Since the DGT dominates the cellular application process and cellular services, the responsibility should be theirs to provide complete and understandable information. A DM message offers scientific and technical sources directly to the adopters or the potential adopters.

This preliminary study has raised more questions than it has answered. In particular, this study raises questions about cellular telephone's role in Taiwanese business organization, and about the role of the media in the diffusion process.

Furthermore, despite predictions, adopters did not report a significantly high level of autonomy than non-adopters. The result was probably affected by the poor level of reliability of this attribute. In further studies, especially outside the United States (the source of the original scale), questions testing "autonomy" should be recast to establish better reliability and validity. Since working environments and conditions (what the "task attributes measurement" is created for) relate to cultural and social backgrounds, questions of "task attributes" must be localized better.

Determining the reason for this requires further research. If cellular adopters do not have more autonomy than non-adopters, do managers

delegate work to adopters through cellular? Did adopters choose to subscribe to cellular because of their perceived needs or those of their supervisors? Do companies adopt cellular for them? Later research may consider the role of cellular technology within the total working environment.

According to Rogers' diffusion model, early adopters should be favorably inclined toward innovation information from the mass media. However, in this research, an inverse relationship was found between cellular adoption and dependency on either the mass media or interpersonal channels. Future studies may investigate the information gathered before adoption decisions are made.

Finally, how does culture affect the relationship between prior information and later adoption? For example, perhaps Taiwanese care more about gaining "status" through an innovation, rather than practice and knowledge of the technology. People may like to be seen using a new technology, thus the interpersonal contacts probably are the best way to impress others. It is hard to say that the Taiwanese cellular adoption rate would not be affected by this different social-culture background. Why Taiwanese made so many more cellular calls than the U.S. cellular users? Is this phenomenon related to the different social system and culture? These questions will probably lead us to the knowledge or attitudes which have been created by Taiwanese towards an innovation.

APPENDIX A

APPENDIX A

PRETEST QUESTIONNAIRE

Hi, I, Hsiu-Yueh Hsu, am a graduate student in Telecommunications at Michigan State University, USA. I am working on my survey concerning telephone communications as a thesis. This questionaire only takes you three minutes. All your answers only attribute to my own academic work, it won't enclose to the public or any other companies. Please feel free to response my questions. Thank you.

PART I

1. On average, how many calls do you make by your regular telephone per week?
   ☐1)0-9 ☐2)10-20 ☐3)21 or more

2. Have you ever used mobile services before?
   ☐1)yes ☐2)no -- Q6

3. If so, which services?
   ☐1) paging ☐2) Citizen Band radio
   ☐3) mobile telephone ☐4) other

4. How often do you make calls by mobile communications?
   ☐1)more than once a day ☐2)daily
   ☐3)several days a week ☐4)once a week
   ☐5)less than once a week

5. Does having experience with mobile communications make you more likely to use cellular telephone?
   ☐1)very likely ☐2)likely ☐3)fair
   ☐4)not so likely ☐5)not at all

6. Do you use cellular telephone?
   ☐1)yes ☐2)no -- Q10

7. How long have you used cellular telephone? _____
   ☐1)less than 3 months ☐2)3 months to 6 months
   ☐3)7 months to 9 months ☐4)10 months to a year
   ☐5)more than a year

8. On average, how many calls do you make by your cellular telephone per week, either incoming or outgoing?
   ☐1)0-9 ☐2)10-20 ☐3)21 or more

9. Why did you decide to use cellular phone? _____
   ☐1)for business ☐2)for personal use
   ☐3)emergency reason ☐4)convenience/time saving
   ☐5)upgrading mobile services ☐6)advertising influence
   ☐7)friends/colleague suggested ☐8) others

10. How much do you know about cellular telephone?
   ☐1)very much ☐2)much ☐3)fair
   ☐4)rare ☐5)no amount

11. How did you learn about cellular telephone (service/equipment)?
   _____
   ☐1) direct mail ☐2) newspaper ☐3) radio
   ☐4) TV -- Q12
   ☐5) sales agent ☐6) friend/colleagues
   ☐7)in-store/ expo display -- Q13-15 ☐8) others

12. How important is it to see/read/hear about cellular information before you make a decision on cellular telephone?
   ☐1)very important ☐2)important
   ☐3)helpful but not necessary ☐4) not so important
   ☐5)not important at all

13. How important is it to talk about cellular services with others before you make a decision on subscribing cellular telephone?
   ☐1)very important ☐2)important
   ☐3)helpful but not necessary ☐4) not so important
   ☐5)not important at all

14. How important is it to talk about cellular equipment with others before you make a decision on selecting cellular equipment?
☐1)very important ☐2)important
☐3)helpful but not necessary ☐4) not so important
☐5)not important at all

15. How important is it to accept others' suggestions before you make a decision on adopting cellular telephone?
☐1)very important ☐2)important
☐3)helpful but not necessary ☐4) not so important
☐5)not important at all

PART II

This part includes thirteen questions concerning the telephone uses and the attributes of your job. It will be very nice that you answer me as very often, often, sometimes, seldom, or never. Or very much, much, fair, rare, or no amount. Thank you.

	REGULAR (CELLULAR)PHONE				
	very often	*often*	*some times*	*seldom*	*never*
1. Call the police or an ambulance in an emergency.	☐	☐	☐	☐	☐
2. Call for roadside service if you have a problem.	☐	☐	☐	☐	☐
3. Call for maintaining a business relationship.	☐	☐	☐	☐	☐
4. Make a reservation or appointment for your business.	☐	☐	☐	☐	☐
5. Call for relieving boredom.	☐	☐	☐	☐	☐
6. Let your family know you are getting home late.	☐	☐	☐	☐	☐
7. Make routine personal call.	☐	☐	☐	☐	☐
	very much	*much*	*fair*	*rare*	*no amount*
8. Increased safety and security provided in the event of an accident or emergency.	☐	☐	☐	☐	☐
9. Efficiently use time due to make calls to save trips.	☐	☐	☐	☐	☐
10. How much of your job depends upon	☐	☐	☐	☐	☐

your ability to work with others?

11. To what extent do you receive information from your superior on your job performance? ☐ ☐ ☐ ☐ ☐
12. How much are you left on your own to do your own work? ☐ ☐ ☐ ☐ ☐
13. To what extent is dealing with other people a part of your job? ☐ ☐ ☐ ☐ ☐

PART III

This part includes six questions concerning your background for research purpose. Please feel free to answer, thank you for your cooperation.

1. Sex?
   ☐1)male ☐2)female

2. Age?
   ☐1)18-24 ☐2)25-30 ☐3)31-40
   ☐4)41-50 ☐5)51 or more

3. What is your highest level of education?
   ☐1)high school or less ☐2)college
   ☐3)college graduate
   ☐4)graduate school--MA, Ph.D.

4. What is your household income monthly?
   ☐1)$20,000 or less ☐2)$20,001-30,000
   ☐3)$30,001-40,000 ☐4)$40,001- 50,000
   ☐5)$50,001 or more

5. What type of occupation do you have?
   ☐1)professional ☐2)construction ☐3)communication
   ☐4)public services/transportation ☐5)small business
   ☐6)trade/manufacturing ☐7)others

6. What is your job title?
   ☐1) president/CEO ☐2) executive ☐3) sales
   ☐4) professional-doctor, lawyer ☐5) others

APPENDIX B

APPENDIX B

QUESTIONNAIRE-- CELLULAR PHONE (CODE BOOK)

Hi, I, Hsiu-Yueh Hsu, am a graduate student in Telecommunications at Michigan State University, USA. I am working on my survey concerning telephone communications as a thesis. This questionaire only takes you three minutes. All your answers only attribute to my own academic work, it won't enclose to the public or any other companies. Please feel free to response my questions. Thank you.

PART I

1. On average, how many calls do you make by your regular telephone per week?
   1□1)0-9 2□2)10-20 3□3)21-40
   4□4)41-60 5□5)61 or more

2. Have you ever used mobile services before?
   2□1)yes 1□2)no -- Q6

3. If so, which services?
   1,2□1) paging 1,2□2) Citizen Band radio
   1,2□3) mobile telephone □4) other

4. How often do you make calls by mobile communications?
   5□1)more than once a day 4□2)daily
   3□3)several days a week 2□4)once a week
   1□5)less than once a week

5. Does having experience with mobile communications make you more likely to use cellular telephone?
   5□1)very likely 4□2)likely 3□3)fair
   2□4)not so likely 1□5)not at all

6. Do you use cellular telephone?
   2□1)yes 1□2)no -- Q10

7. How long have you used cellular telephone? _____
   1□1)less than 3 months 2□2)3 months to 6 months
   3□3)7 months to 9 months 4□4)10 months to a year
   5□5)more than a year

8. On average, how many calls do you make by your cellular telephone per week, either incoming or outgoing?
   1□1)0-9 2□2)10-20 3□3)21-40
   4□4)41-60 5□5)61 or more

9. Why did you decide to use cellular phone? _____
   1,2□1)for business 1,2□2)for personal use
   1,2□3)emergency reason 1,2□4)convenience/time saving
   1,2□5)upgrading mobile services 1,2□6)advertising influence
   1,2□7)friends/colleagues suggested
   1,2□8) others

10. How much do you know about cellular telephone?
   5□1)very much 4□2)much 3□3)fair
   2□4)rare 1□5)no amount

11. How did you learn about cellular telephone (service/equipment)?
   1,2□1) direct mail 1,2□2) newspaper
   1,2□3) radio 1,2□4) TV -- Q12
   1,2□5) sales agent 1,2□6) friend/colleagues
   1,2□7)in-store/ expo display -- Q13-15
   1,2□8) others

12. How important is it to see/read/hear about cellular information before you make a decision on cellular telephone?
   5□1)very important 4□2)important
   3□3)helpful but not necessary
   2□4) not so important 1□5)not important at all

13. How important is it to talk about cellular services with others before you make a decision on subscribing cellular telephone?
   5□1)very important 4□2)important
   3□3)helpful but not necessary
   2□4) not so important 1□5)not important at all

14. How important is it to talk about cellular equipment with others before you make a decision on selecting cellular equipment?
    5☐1)very important 4☐2)important
    3☐3)helpful but not necessary
    2☐4) not so important 1☐5)not important at all

15. How important is it to accept others' suggestions before you make a decision on adopting cellular telephone?
    5☐1)very important 4☐2)important
    3☐3)helpful but not necessary
    2☐4) not so important 1☐5)not important at all

PART II

This part includes thirteen questions concerning the telephone uses and the attributes of your job. It will be very nice that you answer me as very often, often, sometimes, seldom, or never. Or very much, much, fair, rare, or no amount. Thank you.

	CELLULAR PHONE				
	very often	*often*	*some times*	*seldom*	*never*
1. Call the police or an ambulance in an emergency.	☐5	☐4	☐3	☐2	☐1
2. Call for roadside service if you have a problem.	☐5	☐4	☐3	☐2	☐1
3. Call for maintaining a business . relationship	☐5	☐4	☐3	☐2	☐1
4. Make a reservation or appointment for your business.	☐5	☐4	☐3	☐2	☐1
5. Call for relieving boredom.	☐5	☐4	☐3	☐2	☐1
6. Let your family know you are getting home late.	☐5	☐4	☐3	☐2	☐1
7. Make routine personal call.	☐5	☐4	☐3	☐2	☐1
	very much	*much*	*fair*	*rare*	*no amount*
8. Increased safety and security provided in the event of an accident or emergency.	☐5	☐4	☐3	☐2	☐1
9. Efficiently use time due to make calls to save trips.	☐5	☐4	☐3	☐2	☐1

10. How much of your job depends upon your ability to work with others?	□5	□4	□ 3	□2	□1
11. To what extent do you receive information from your superior on your job performance?	□1	□2	□3	□4	□5
12. How much are you left on your own to do your own work?	□5	□4	□ 3	□2	□1
13. To what extent is dealing with other people a part of your job?	□5	□4	□ 3	□2	□1

PART III

This part includes six questions concerning your background for research purpose. Please feel free to answer, thank you for your cooperation.

1. Sex?
   1□1)male 2□2)female

2. Age?
   1□1)18-24 2□2)25-30 3□3)31-40
   4□4)41-50 5□5)51 or more

3. What is your highest level of education?
   1□1)uneducated 2□2)elementary school/junior high
   3□3)high school 4□4)college/university
   5□5)graduate school--MA, Ph.D.

4. What is your household income monthly?
   1□1)$20,000 or less 2□2)$20,001-30,000
   3□3)$30,001-40,000 4□4)$40,001- 50,000
   5□5)$50,001 or more

5. What type of occupation do you have?
   _____

6. What is your job title? _____

APPENDIX C

APPENDIX C

QUESTIONNAIRE -- FIXED PHONE

Hi, I, Hsiu-Yueh Hsu, am a graduate student in Telecommunications at Michigan State University, USA. I am working on my survey concerning telephone communications as a thesis. This questionaire only takes you three minutes. All your answers only attribute to my own academic work, it won't enclose to the public or any other companies. Please feel free to response my questions. Thank you.

PART I

1. On average, how many calls do you make by your regular telephone per week?
   ☐1)0-9 ☐2)10-20 ☐3)21-40
   ☐4)41-60 ☐5)61 or more

2. Have you ever used mobile services before?
   ☐1)yes ☐2)no -- Q6

3. If so, which services?
   ☐1) paging ☐2) Citizen Band radio
   ☐3) mobile telephone ☐4) other

4. How often do you make calls by mobile communications?
   ☐1)more than once a day ☐2)daily
   ☐3)several days a week ☐4)once a week
   ☐5)less than once a week

5. Does having experience with mobile communications make you more likely to use cellular telephone?
   ☐1)very likely ☐2)likely ☐3)fair
   ☐4)not so likely ☐5)not at all

6. How much do you know about cellular telephone?
   ☐1)very much ☐2)much ☐3)fair -- Q7
   ☐4)rare ☐5)no amount -- Part II

7. How did you learn about cellular telephone (service/equipment)?
   ☐1) direct mail ☐2) newspaper
   ☐3) radio ☐4) TV -- Q8
   ☐5) sales agent ☐6) friend/colleagues
   ☐7)in-store/ expo display -- Q9-11
   ☐8) others

8. How important is it to see/read/hear about cellular information before you make a decision on cellular telephone?
   ☐1)very important ☐2)important
   ☐3)helpful but not necessary
   ☐4) not so important ☐5)not important at all

9. How important is it to talk about cellular services with others before you make a decision on subscribing cellular telephone?
   ☐1)very important ☐2)important
   ☐3)helpful but not necessary
   ☐4) not so important ☐5)not important at all

10. How important is it to talk about cellular equipment with others before you make a decision on selecting cellular equipment?
   ☐1)very important ☐2)important
   ☐3)helpful but not necessary
   ☐4) not so important ☐5)not important at all

11. How important is it to accept others' suggestions before you make a decision on adopting cellular telephone?
   ☐1)very important ☐2)important
   ☐3)helpful but not necessary
   ☐4) not so important ☐5)not important at all

PART II

This part includes thirteen questions concerning the telephone uses and the attributes of your job. It will be very nice that you answer me as very often, often, sometimes, seldom, or never. Or very much, much, fair, rare, or no amount. Thank you.

	REGULAR PHONE				
	very often	*often*	*some-times*	*seldom*	*never*
1. Call for relieving boredom.	☐	☐	☐	☐	☐
2. Let your family know you are getting home late.	☐	☐	☐	☐	☐
3. Make routine personal calls.	☐	☐	☐	☐	☐
4. Call for maintaining a business relationship.	☐	☐	☐	☐	☐
5. Make a reservation or appointment for your business.	☐	☐	☐	☐	☐
6. You will call the police or an ambulance if in an emergency.	☐	☐	☐	☐	☐
7. Call for roadside service if you have a problem.	☐	☐	☐	☐	☐
	very much	*much*	*fair*	*rare*	*no amount*
8. Increased safety and security provided in the event of an accident or emergency.	☐	☐	☐	☐	☐
9. Efficiently use time due to make calls to save trips.	☐	☐	☐	☐	☐
10. How much of your job depends upon your ability to work with others?	☐	☐	☐	☐	☐
11. To what extent do you receive information from your superior on your job performance?	☐	☐	☐	☐	☐
12. How much are you left on your own to do your own work?	☐	☐	☐	☐	☐
13. To what extent is dealing with other people a part of your job?	☐	☐	☐	☐	☐

PART III

This part includes six questions concerning your background for research purpose. Please feel free to answer, thank you for your cooperation.

1. Sex?
   ☐1)male ☐2)female

2. Age?
   ☐1)18-24 ☐2)25-30 ☐3)31-40
   ☐4)41-50 ☐5)51 or more

3. What is your highest level of education?
   ☐1)uneducated ☐2)elementary school/junior high
   ☐3)high school ☐4)college/university
   ☐5)graduate school--MA, Ph.D.

4. What is your household income monthly?
   ☐1)$20,000 or less ☐2)$20,001-30,000
   ☐3)$30,001-40,000 ☐4)$40,001- 50,000
   ☐5)$50,001 or more

5. What type of occupation do you have?
   _____

6. What is your job title?
   _____

APPENDIX D

APPENDIX D

THE LEVELS OF PROFESSIONS

LEVEL 1: Unskilled workers:

Apprentice, tenant farmer, cleaning maid, servant, gate guard, jobber, peddler, housekeeper, retired person, non-worker.

LEVEL 2: Semiskilled workers:

Mechanic, boss or proprietress, salesperson or salesclerk, dealer, tiller, driver or chauffeur, hair stylist, barber, mailman, typist, cook or chauffeur, soldier.

LEVEL 3: Semiprofessionals, executive or skilled workers:

Small business owner and manager, officer, governmental employee, cashier, clerk, county commissioner, wholesale dealer, bartender, lieutenant, policeman, fireman, secretary, movie or TV actor, fashion designer, sailor.

LEVEL 4: Professionals or superior executive:

Large business owner and manager, superior officer, principle of primary and high school, teacher of primary and high school, accountant, lawyer, judge, architect, engineer, representative of district, county manager, police officer, first-mate, colonel, newscaster/reporter, nurse, priest, writer, musician, painter, photographer.

LEVEL 5: High level professionals or top executive:

Principal of college/university, teacher of college or university, scientist, highest level officer, nurse supervisor, doctor, congressman, senator, president/CEO, general, captain, presiding judge.

Note. 1. Small business owns less than 10 employees.
2. Large business owns equal or more than 10 employees.
3. The source origins from the questionnaire along with Cellular Business (February 1990).
4. From Pavalko (1971 & 1972), Centers (1949).

APPENDIX E

APPENDIX E

QUESTIONNAIRES IN CHINESE

A. Pretest Questionnaire

您好! 我是美國密西根州大的研究生徐秀月,正從事電話的傳播行為研究,作為畢業的論文。請您撥出 5 分鐘,回答幾個問題這些收集的資料只用於學術研究,不會對外公開,請安心作答。謝謝您的合作與支持!

第一部分:

1. 請問您每星期平均用過幾次電話?
   1) 0-9　　2) 10-20　　3) 21 次以上

2. 請問您以前用過無線電話服務嗎?
   1) 用過　　2) 沒用過 -- 跳至同題 6

3. 哪一種服務?
   1) 呼叫器　　2) 無線電對講機　　3) 行動電話　　4) 其它

4. 請問您多久使用一次無線電話系統?
   1) 一天一次以上　　2) 一天一次　　3) 三天一次
   4) 一週一次　　5) 一週一次以下

5. 您認為,有使用無線電話系統的經驗,會使您比較可能用大哥大電話嗎?
   1) 非常可能　　2) 可能　　3) 不一定
   4) 不可能　　5) 非常不可能

6. 請問您使用大哥大電話嗎?
   1) 用過　　2) 沒用過 --跳至同題 10

7. 多久了? _____
   1) 少於三個月　　2) 三至六個
   3) 七至九個月　　4) 十個月至一年　　5) 一年以上

8. 請問您每星期平均用過幾次大哥大電話,包括打進與打出?
   1) 0-9　　2) 10-20　　3) 21 次以上

9. 請問您,什麼理由使您決定使用大哥大電話?
   1) 做生意　　2) 私人用途　　3) 緊急用途
   4) 方便/節省時間　　5) 使用較新科技　　6) 廣告影響
   7) 朋友/同事建議　　8) 其它

10. 請問您,知道多少有關大哥大電話的資訊?
1) 非常多　　2) 很多　　3) 一些 --跳至問題 11
4) 不知道　　5) 沒聽說 --跳至第二部分

11. 請問您,怎麼得知大哥大電話的資訊?
1) 郵寄信件/DM　　2) 報紙　　3)廣播
4) 電視 -- 跳至問題 12
5) 代理商/售貨專員　　6) 朋友/同事
7) 商店/展示會 -- 跳至問題 13
8) 其它

12. 您認為,在決定採用大哥大電話前,先從媒體(看聽讀)吸收大哥大的資訊,是很重要的嗎?
1) 非常重要　　2) 重要　　3) 需要但不必要
4) 不重要　　5) 非常不重要

13. 您認為,在決定採用大哥大電話前,先跟其他人討論大哥大電話的服務,是很重要的嗎?
1) 非常重要　　2) 重要　　3) 需要但不必要
4) 不重要　　5) 非常不重要

14. 您認為,在選用大哥大電話及其它用具前,先跟其他人討論,是很重要的嗎?
1) 非常重要　　2) 重要　　3) 需要但不必要
4) 不重要　　5) 非常不重要

15. 您認為,在決定採用大哥大電話前,先接受別人討論,是很重要的嗎?
1) 非常重要　　2) 重要　　3) 需要但不必要
4) 不重要　　5) 非常不重要

第二部分:

這部分有十三個問題。請問您有關電話使用及工作的屬性。
請回答:常常,通常,有時,很少,從不。謝謝!

	常常	通常	有時	很少	從不
1. 請問您,常常會使用(大哥大)電話排遣無聊嗎?	□	□	□	□	□
2. 請問您,常常會使用(大哥大)電話告訴家人您將晚回家嗎?	□	□	□	□	□
3. 請問您,常常會使用(大哥大)電話打給固定的幾個人嗎?	□	□	□	□	□
4. 請問您,常常會使用(大哥大)電話維持商務關係嗎?	□	□	□	□	□
5. 請問您,常常會使用(大哥大)電話安排談生意或公務的時間嗎?	□	□	□	□	□
6. 請問您,常常會在緊急時,用(大哥大)電話打給警察或救護車嗎?	□	□	□	□	□
7. 請問您,常常會在汽車有問題時,用(大哥大)電話請汽車維護人員來嗎?	□	□	□	□	□
	常常	通常	有時	很少	從不
8. 您認為,在發生緊急事故時,有(大哥大)電話可增加心中的安全感。	□	□	□	□	□
9. 您認為,有(大哥大)電話可避免出公差或商務旅行,節省時間又有效率。	□	□	□	□	□
10. 請問您,您的工作表現常常取決在與他人共同商議解決事情的能力。	□	□	□	□	□
11. 請問您,您的上司常常會在您的工作表現上有意見嗎?	□	□	□	□	□
12. 請問您,在工作上,常常單獨完成作業。	□	□	□	□	□
13. 請問您,面對別人,與人溝通常常是您工作的一部分。	□	□	□	□	□

第三部分:

這部分有五個問題。請問您個人的資料。謝謝!

1. 性別: 1) 男　　2) 女

2. 年齡:
   1) 18-24　　2) 25-30　　3) 31-40
   4) 41-50　　5) 51 以上

3. 教育程度:
   1) 未受教育　　2) 小學/初中　　3) 高中
   4) 大專/大學　　5) 研究所及以上

4. 每月月收入:
   1) $20,000 以下　　2) $20,001-30,000　　3) $30,001-40,000
   4) $40,001-50,000　　5) $50,001 以上

5. 職業:
   1) 專業人員　　2) 建築業　　3) 傳播業
   4) 公共/交通業　　5) 中小企業　　6) 商業/工廠
   7) 其它

6. 職位:
   1) 總裁/董事長　　2) 經理/執行人　　3) 銷售員
   4) 醫生/律師　　5) 其它

B. Questionnaire -- Cellular Phone

您好! 我是美國密西根州大的研究生徐秀月,正從事電話的傳播行為研究,作為畢業的論文。請您撥出5分鐘,回答幾個問題
這些收集的資料只用於學術研究,不會對外公開,
請安心作答。謝謝您的合作與支持!

第一部分:

1. 請問您每星期平均用過幾次電話?
   1) 0-9 2) 10-20 3) 21-40
   4) 41-60 5) 61 次以上

2. 請問您以前用過無線電話服務嗎?
   1) 用過 2) 沒用過 -- 跳至問題 6

3. 哪一種服務?
   1) 呼叫器 2) 無線電對講機 3) 行動電話 4) 其它

4. 請問您多久使用一次無線電話系統?
   1) 一天一次以上 2) 一天一次 3) 三天一次
   4) 一週一次 5) 一週一次以下

5. 您認為,有使用無線電話系統的經驗,會使您比較可能用大哥大電話嗎?
   1) 非常可能 2) 可能 3) 不一定
   4) 不可能 5) 非常不可能

6. 請問您使用大哥大電話嗎?
   1) 用過 2) 沒用過 -- 跳至問題 10

7. 多久了?
   1) 少於三個月 2) 三至六個月 3) 七至九個月
   4) 十個月至一年 5) 一年以上

8. 請問您每星期平均用過幾次大哥大電話,包括打進與打出?
   1) 0-9 2) 10-20 3) 21-40
   4) 41-60 5) 61 次以上

9. 請問您,什麼理由使您決定使用大哥大電話?
   1) 做生意 2) 私人用途 3) 緊急用途
   4) 方便/節省時間 5) 使用較新科技 6) 廣告影響
   7) 朋友/同事建議 8) 其它

10. 請問您,知道多少有關大哥大電話的資訊?
   1) 非常多 2) 很多 3) 一些 -- 跳至問題 11
   4) 不知道 5) 沒聽說 -- 跳至第二部分

11. 請問您，怎麼得知大哥大電話的資訊?
1) 郵寄信件/DM　2) 報紙　3) 廣播
4) 電視 -- 跳至問題 12
5) 代理商/售貨專員　6) 朋友/同事
7) 商店/展示會 -- 跳至問題 13-15
8) 其它

12. 您認為，在決定採用大哥大電話前，先從媒體(看聽讀)吸收大哥大的資訊，是很重要的嗎?
1) 非常重要　2) 重要　3) 需要但不必要
4) 不重要　5) 非常不重要

13. 您認為，在決定採用大哥大電話前，先跟其他人討論大哥大電話的服務，是很重要的嗎?
1) 非常重要　2) 重要　3) 需要但不必要
4) 不重要　5) 非常不重要

14. 您認為，在選用大哥大電話及其它用具前，先跟其他人討論，是很重要的嗎?
1) 非常重要　2) 重要　3) 需要但不必要
4) 不重要　5) 非常不重要

15. 您認為，在決定採用大哥大電話前，先接受別人討論，是很重要的嗎?
1) 非常重要　2) 重要　3) 需要但不必要
4) 不重要　5) 非常不重要

第二部分:

這部分有十三個問題。請問您有關電話使用及工作的屬性。請回答:常常,通常,有時,很少,從不;或:很多,普通,有些,很少,沒有。謝謝!

	常常	通常	有時	很少	從不
1. 請問您,常常會使用(大哥大)電話排遣無聊嗎?	□	□	□	□	□
2. 請問您,常常會使用(大哥大)電話告訴家人您將晚回家嗎?	□	□	□	□	□
3. 請問您,常常會使用(大哥大)電話打給固定的幾個人嗎?	□	□	□	□	□
4. 請問您,常常會使用(大哥大)電話維持商務關係嗎?	□	□	□	□	□
5. 請問您,常常會使用(大哥大)電話安排談生意或公務的時間嗎?	□	□	□	□	□
6. 請問您,常常會在緊急時,用(大哥大)電話打給警察或救護車嗎?	□	□	□	□	□
7. 請問您,常常會在汽車有問題時,用(大哥大)電話請汽車維護人員來嗎?	□	□	□	□	□

	很多	普通	有些	很少	沒有
8. 您認為,在發生緊急事故時,有(大哥大)電話可增加心中的安全感。	□	□	□	□	□
9. 您認為,有(大哥大)電話可避免出公差或商務旅行,節省時間又有效率。	□	□	□	□	□
10. 請問您,您的工作表現/績效常常取決在與他人共同商議解決事情的能力。	□	□	□	□	□
11. 請問您,您的上司常常會在您的工作表現上有意見嗎?	□	□	□	□	□
12. 請問您,在工作上,常常單獨完成作業。	□	□	□	□	□
13. 請問您,面對別人,與人溝通常常是您工作的一部分。	□	□	□	□	□

第三部分:

這部分有五個問題。請問您個人的資料。謝謝!

1. 性別: 1) 男　　2) 女

2. 年齡:
   1) 18-24　　2) 25-30　　3) 31-40
   4) 41-50　　5) 51 以上

3. 教育程度:
   1) 未受教育　　2) 小學/初中　　3) 高中
   4) 大專/大學　　5) 研究所及以上

4. 每月月收入:
   1) $20,000 以下　　2) $20,001-30,000　　3) $30,001-40,000
   4) $40,001-50,000　　5) $50,001 以上

5. 職業:

   就職於:_____

   職位:_____

C. Questionnaire -- Fixed Phone

您好! 我是美國密西根州大的研究生徐秀月,正從事電話的傳播行為研究,作為畢業的論文。請您撥出5分鐘,回答幾個問題這些收集的資料只用於學術研究,不會對外公開,請安心作答。謝謝您的合作與支持!

第一部分:

1. 請問您每星期平均用過幾次電話?
   1) 0-9 2) 10-20 3) 21-40
   4) 41-60 5) 61 次以上

2. 請問您以前用過無線電話服務嗎?
   1) 用過 2) 沒用過--跳至同題 6

3. 哪一種服務?
   1) 呼叫器 2) 無線電對講機
   3) 行動電話 4) 其它

4. 請問您多久使用一次無線電話系統?
   1) 一天一次以上 2) 一天一次
   3) 三天一次 4) 一週一次
   5) 一週一次以下

5. 您認為,有使用無線電話系統的經驗,會使您比較可能用大哥大電話嗎?
   1) 非常可能 2) 可能 3) 不一定
   4) 不可能 5) 非常不可能

6. 請問您,知道多少有關大哥大電話的資訊?
   1) 非常多 2) 很多 3) 一些 -- 跳至同題 7
   4) 不知道 5) 沒聽說 -- 跳至第二部分

7. 請問您,怎麼得知大哥大電話的資訊?
   1) 郵寄信件/DM 2) 報紙 3) 廣播
   4) 電視 -- 跳至同題 8
   5) 代理商/售貨專員 6) 朋友/同事
   7) 商店/展示會 -- 跳至同題9-11
   8) 其它

8. 您認為,在決定採用大哥大電話前,先從媒體(看聽讀)吸收大哥大的資訊,是很重要的嗎?
   1) 非常重要 2) 重要 3) 需要但不必要
   4) 不重要 5) 非常不重要

9. 您認為,在決定採用大哥大電話前,先跟其他人討論大哥大電話的服務,是很重要的嗎?
1) 非常重要 2) 重要 3) 需要但不必要
4) 不重要 5) 非常不重要

10. 您認為,在選用大哥大電話及其它用具前,先跟其他人討論,是很重要的嗎?
1) 非常重要 2) 重要 3) 需要但不必要
4) 不重要 5) 非常不重要

11. 您認為,在決定採用大哥大電話前,先接受別人討論,是很重要的嗎?
1) 非常重要 2) 重要 3) 需要但不必要
4) 不重要 5) 非常不重要

第二部分:

這部分有十三個問題。請問您有關電話使用及工作的屬性。請回答:常常,通常,有時,很少,從不;或:很多,普通,有些,很少,沒有。謝謝!

	常常	通常	有時	很少	從不
1. 請問您,常常會使用(大哥大)電話排遣無聊嗎?	□	□	□	□	□
2. 請問您,常常會使用(大哥大)電話告訴家人您將晚回家嗎?	□	□	□	□	□
3. 請問您,常常會使用(大哥大)電話打給固定的幾個人嗎?	□	□	□	□	□
4. 請問您,常常會使用(大哥大)電話維持商務關係嗎?	□	□	□	□	□
5. 請問您,常常會使用(大哥大)電話安排談生意或公務的時間嗎?	□	□	□	□	□
6. 請問您,常常會在緊急時,用(大哥大)電話打給警察或救護車嗎?	□	□	□	□	□
7. 請問您,常常會在汽車有問題時,用(大哥大)電話請汽車維護人員來嗎?	□	□	□	□	□

	很多	普通	有些	很少	沒有
8. 您認為,在發生緊急事故時,有(大哥大)電話可增加心中的安全感。	□	□	□	□	□
9. 您認為,有(大哥大)電話可避免出公差或商務旅行,節省時間又有效率。	□	□	□	□	□
10. 請問您,您的工作表現/績效常常取決在與他人共同商議解決事情的能力。	□	□	□	□	□
11. 請問您,您的上司常常會在您的工作表現上有意見嗎?	□	□	□	□	□
12. 請問您,在工作上,常常單獨完成作業。	□	□	□	□	□
13. 請問您,面對別人,與人溝通常常是您工作的一部分。	□	□	□	□	□

第三部分:

這部分有五個問題。請問您個人的資料。謝謝!

1. 性別: 1) 男　　2) 女

2. 年齡:
   1) 18-24　　2) 25-30　　3) 31-40
   4) 41-50　　5) 51 以上

3. 教育程度:
   1) 未受教育　　2) 小學/初中　　3) 高中
   4) 大專/大學　　5) 研究所及以上

4. 每月月收入:
   1) $20,000 以下　　2) $20,001-30,000　　3) $30,001-40,000
   4) $40,001-50,000　　5) $50,001 以上

5. 職業:

   就職於:_____

   職位:_____

D: The Levels of Professions

職業分類表:

第一級: 無技術(非技術)性工人:
工廠工人, 學徒, 小販, 佃農/漁夫, 清潔工/雜工, 臨時工/工人, 建築管理員/門房, 傭工/女傭, 服務/侍應, 舞(酒)女, 無業, 家庭主婦。

第二級: 技術性工人:
技工/水電匠, 店員/小店主, 零售員/推銷員, 自耕農, 司機, 裁縫, 廚司, 美容師/理髮師, 郵差, 士官兵, 打字員, 領班/監工。

第三級: 半專業(一般)公務人員:
技術員/技佐, 委任級公務人員, 科員/行員/出納員, 縣市議員, 鄉鎮民代表, 批發商/代理商/包商, 尉級軍官, 警察/女警/消防隊員, 秘書/代書, 船員, 電視/電影演員, 服裝設計師。

第四級: 專業(行政)人員:
中小學校長, 中小學教師, 會計師, 法官/推事, 律師, 工程師/建築師, 簡任級公務人員, 公司行號科長, 院轄市議員/省議員, 經理/襄理/協理/副理, 校級軍官警官, 大副, 作家/畫家/音樂家, 新聞/電視記者。

第五級: 高級專業(行政)人員:
大專校長, 大專教師, 醫理長, 大法官, 科學家, 特任/簡任級公務人員, 立法委員/監察委員/考試委員, 國大代表, 董事長/總經理, 將級軍官, 船長。

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