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PREVIEW

AN EMPIRICAL ANALYSIS OF ADOPTION AND UTILIZATION OF
TELECOMMUNICATION TECHNOLOGY: A PROSPECTIVE STUDY OF
ELECTRONIC MAIL SYSTEMS

by

Sung Kim

A DISSERTATION

Presented to the Faculty of
The Graduate College in the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Doctor of Philosophy

Major: Interdepartmental Area of Business
(Management)

Under the Supervision of Professor Sang M. Lee

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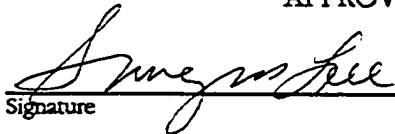
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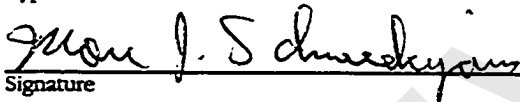
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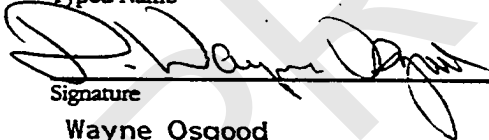
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GRADUATE COLLEGE
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AN EMPIRICAL ANALYSIS OF ADOPTION AND UTILIZATION OF
TELECOMMUNICATION TECHNOLOGY: A PROSPECTIVE STUDY OF
ELECTRONIC MAIL SYSTEMS

Sung Kim, Ph.D.

University of Nebraska, 1995

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Over the past decade, telecommunication technologies have captured managers' imaginations as vehicles for growth and competition in this rapidly changing business environment. There are strong arguments that telecommunications technologies, such as E-mail, can help overcome many communication inefficiencies in an environment where the managers and professionals already spend a large portion of their work day in communication-related activities.

While the importance of telecommunication technologies in modern organizations has been recognized, very little empirical research addresses this issue. It is apparent that to better manage these powerful technologies, we must develop a better understanding of the factors that influence the end-users decision to adopt and utilize a telecommunication technology such as E-mail.

The purpose of this research was to develop and test the study model of adoption and utilization of E-mail. The research involved a field study of over 280 managers and professionals from 12 companies. Interview and survey techniques were employed to collect data. The strength of this study was integration of the diffusion of innovation (DOI) model, a widely accepted adoption and usage model.

The results of the study showed, as expected, the attainment of critical mass of E-mail users is most critical factor in influencing an individuals use of E-mail. Controlling for critical mass, perceived relative advantage was the most significant predictor of E-mail use, accounting for 12 percent of the variance in the level of E-mail use. Relative complexity showed a modest relationship with the usage. As hypothesized, computer self-efficacy influenced E-mail usage through perceived attributes of the system. The perceived attributes of E-mail that were examined consisted of perceived relative advantage, perceived compatibility, and perceived complexity. Previous experience showed a significant direct relationship with level of use, contradicting the hypothesis that perceived attributes of E-mail mediate the relationship between experience and usage. Task interdependence was not significantly related to E-mail use. In addition to future research implications, these finding has important implications for practitioners in managing and selecting telecommunication systems such as E-mail.

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CHAPTER 1

INTRODUCTION

Recently, the globalization of competition has become the rule rather than the exception for most industries. To compete effectively, at home or globally, it is essential for corporations to adapt to the changing rules of the corporate arena for their long-run competitive success (Porter, 1990). A substantial body of literature reports that managers and professionals spend a large proportion of their work day in communication-related activities, as much as 70 to 80 percent (Mintzberg, 1973; Ruchinskas, 1982; Rice and Bair, 1984; Trevino, et al., 1990). Today, with the increasing globalization of business, erosion of corporate hierarchies, and dispersion of business activities, the issue of more efficient and effective communication within and across organizations has become even more important.

The argument is made by proponents of new office technologies that computer mediated communication systems can overcome many of the inefficiencies of communication in this changing work environment (Crawford, 1982; Ives and Jarvenpaa, 1991; Straub, 1994; Grover and Goslar, 1993). Electronic communications technology such as electronic mail (E-mail) transcends distance barriers and, because it can be an asynchronous form of communication, relieves the time

consuming and most frustrating efforts of playing "phone tag" between communicators.

Many researchers have expressed how important the impact of electronic communication systems will be on organizations in future. Straub and Wetherbe (1989) contend that electronic communications will be significant forces for change during the 1990s. Grover and Goslar (1993) suggest that electronic communication technologies will play a vital role in the streamlining of organizational communications and improving the substance of coordination in the future. Some contend that it will be an indispensable productivity tool to individuals in organizations (Blum and Litwack, 1995; Culnan and Markus, 1987).

E-mail, in its simplest terms, is any technology enabling exchange of electronic messages between users. The term E-mail is used in its broadest sense for person-to-person, person-to-application, application-to-person, and application-to-application communication.¹ Blum and Litwack (1995) offer the following as E-mail vision statement:

E-mail is a key communications application of the information age. It enables people or mail-enabled applications to exchange revisable multi-media information, workflow, and electronic data interchange transactions. This exchange can occur with anyone, anytime, anywhere with speed, ease of use, intelligence, and at low cost.

While few will deny the importance of electronic communication technologies, it is surprising to find very

little empirical research on topics related to the subject in the information systems (IS) literature.

1.1 PROBLEM STATEMENT

In recognition of the values of IT, such as electronic communication systems, organizations continue to invest heavily in the acquisition of information technology. In fact, expenditure on IT resources in 1987 amounted to nearly 40 percent of the annual capital investment made by U.S. businesses (Business Week, October 12, 1987), and we can only assume the organizations' spending on IT acquisition and maintenance would be much greater today. The reasons for this investment vary, but the overriding belief is that knowledge workers will need and use the technology to become more productive (in terms of efficiency and effectiveness). The availability of the technology, however, does not guarantee increased utilization or job performance. As Lee (1986) notes, when use is optional, the patterns of usage vary substantially.

Therefore, it is apparent that one of the challenges for many firms today is to effectively manage the adoption and utilization of IT such as electronic communications systems. A recent delphi-survey of senior information system (IS) executives identified (1) facilitating organizational learning and use of IT, and (2) the planning

and implementing a telecommunications system as two of the most important MIS concerns today (Niederman et al., 1991).

The challenges of managing the adoption and utilization of new IT in the work place are not a new experience to most organizations. It is generally understood that managing IT successfully not only involves having the technological expertise but also an understanding of the nature or characteristics of the individuals within the organization. Tichy (1982) contends that technological innovation is not solely a technological change; rather, it is social change affecting the behaviors of individuals and groups within the organization. Kling and Scacchi (1980), however, stated that the technical aspects of most IT are relatively well understood, while the behavioral and social aspects of computing have been inadequately investigated. This view has been shared by many researchers (Strassman, 1985; Clarke, 1988; Robertson, 1989; Nelson, 1990).

Researchers in IS have called for studies that examine individual, group, and organizational influence (Nelson, 1990; Markus and Robey, 1988). Therefore, one of the objectives of this study is to add to the understanding of behavioral and social aspects involved in adoption and utilization of IT in the context of electronic communications systems. A search of the literature toward that end led to the classic diffusion of innovation (DOI) model (Rogers and Shoemaker, 1971; Roger, 1983) to ground the current study.

The diffusion of innovation model, defined by Rogers and Shoemaker (1971) and further refined by Rogers (1983) provides well developed concepts to study the management of IT adoption and diffusion. The DOI model provides the means to assess the likely rate of diffusion of technology as well as to identify the factors that may facilitate or retard technology adoption and utilization. Some factors include the adopters perceived characteristics of the technology, individual characteristics of adopters, and situational factors which may influence and persuade the potential adopters. The DOI model seems especially appropriate for this study because, although the model can be used to study organizational level adoption of IT (Alexander, 1989, Brancheau, 1987), much of the DOI model was developed in relations to voluntary adoption of innovation by individuals. The adoption and utilization of electronic communication systems within an organization involve mostly voluntary use by the principle beneficiaries of the systems.

1.2 RESEARCH QUESTIONS

The primary research questions to be addressed in this study are:

- 1) What factors are important in an individual's adoption and utilization of electronic communication systems within an organizational setting, in particular, the

adoption and utilization of E-mail?

- 2) What are the relationships between the identified factors in influencing the adoption and use of electronic communication systems within an organizational setting, in particular, adoption and utilization of E-mail?

Prior studies suggest some interactions and mediating effects between explanatory factors.

- 3) Are there any factors that are different or unique in influencing the adoption and use of electronic communication systems such as E-mail versus other information technologies?

1.3 IMPORTANCE OF THE STUDY

Electronic communications technology, in particular E-mail, is expected to have its greatest impact on the streamlining of organizational communications, and as an indispensable productivity tool to countless individuals in the organization. Though the importance of electronic communication systems have been recognized, a concern over the lack of empirical studies in the area has been mentioned (Grover and Goslar, 1993b). Therefore, development of the study model (See Figure 3.2; p. 46), and the empirical results generated will be an interest to a variety of

different groups. This study will add to the understanding of adoption and utilization processes of IT for the benefit of the researchers in IS. The strong correlation between the attitude toward a behavior and the behavior itself has been established (Davis et al., 1989; Ajzen and Fishbein 1980). However, studies looking at the interaction effects of the attitude with other factors which influence that behavior (such as adoption and utilization) have been limited. A single study cannot cover all the relevant factors, however this study will add to the understanding of the behavior in IS research.

Benefits will also be gained by IS professionals, and the people within the management of an organization. When planning a new system, IS practitioners would like to be able to predict whether the new system will be acceptable to users, diagnose the reasons why a planned system may not be fully acceptable to users, and take corrective action to increase the acceptability of the system in order to enhance the business impact resulting from the large investments in time and money associated with introducing new information technologies to organizations. The present study addresses those concerns. Overall, this study should yield practical information to evaluate and improve the acceptability of the family of IT called electronic communication systems. The proprietors of the IT products can also benefit from the results of the study.

1.4 ORGANIZATION OF THE DISSERTATION

The remainder of this dissertation is organized into five additional chapters.

Chapter Two introduces diffusion of innovation theory and discusses the benefits and problems associated with E-mail. It provides a thorough review of selected significant literatures. Finally, it reviews relevant prior studies which lend support for each of the variables that are included in the study.

Chapter Three develops the model and advances a series of hypotheses to be tested

Chapter Four describes the research design in terms of its methods, context, variables, and procedures. It provides a descriptions of the unit of analysis, sample respondents, data collection procedures, and measures of constructs.

Chapter Five provides the results of the study. It describes the analysis used to test the models and various hypotheses in this study. It also provides the descriptive characteristics of the respondents.

Chapter Six offers a discussion of the results. It summarizes the test results, and suggests a number of research and practice implications. Chapter concludes with a review of the limitations, and strengths of the study.

Finally, the appendices provide some informative tables relevant to the development of the study and research instruments.

PREVIEW

CHAPTER 2

LITERATURE REVIEW

This chapter consists, in part, of a review of adoption and diffusion theory. It also contains a review of electronic mail systems and relevant significant prior studies conducted in adoption and diffusion of information technology. This will be followed by a review of the literature pertaining to the constructs such as task interdependence, social norm and critical mass which are included in the present study.

2.1 INNOVATION DIFFUSION

Adoption and diffusion of innovation represent an area of interest to many disciplines. Research conducted in the general area of innovation adoption and diffusion is very impressive. Rogers (1983), in a widely cited work, synthesized and evaluated over 3000 studies of adoption and diffusion covering various disciplines. The result of this work has led to the development of a theoretical framework which has been applied across various disciplines including the study of technology adoption, diffusion, implementation, and use (Brancheau, 1987; Alexander 1989; Moore 1987; Gurbaxani, 1990; Thompson et al., 1994). Rogers' (1983) framework provides tools, both quantitative and qualitative,

for assessing the likely rate of diffusion of a technology, as well as, identifying numerous factors that affect technology adoption, implementation and use.

2.2 DIFFUSION OF INNOVATION MODEL (DOI)

Innovation diffusion can be defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1983).

There are some well-established generalizations in the diffusion model offered by Rogers (1983):

Innovation Characteristics

There are certain characteristics of innovation (i.e., relative advantage, compatibility, complexity, trialability and observability) which, as perceived by adopters, determine the ultimate rate and pattern of adoption. Discussion of these characteristics of innovation will be presented in section 2.6.1.

Innovativeness

Some individuals are more innovative than others. This occurs because members of a social system differ in their propensity to adopt innovations. Based on this propensity (which can be identified by their personal characteristics such as "cosmopolitanism", level of education, etc.), members can be classified into categories (Figure 2.1) such