Determining Factors in the Usage of Software Applications By End Users in a Not-for-Profit Environment

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It must be considered that there is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all those who profit by the old order, and only lukewarm defenders in all those who would profit by the new order, this lukewarmness arising partly from fear of their adversaries, who have the laws in their favour; and partly from the incredulity of mankind, who do not truly believe in anything new until they have had actual experience of it. ***Machiavelli, The Prince, pp. 49-50***

The objective of this paper is to determine which factors influence the usage of software applications, both the total amount of applications used, and the specific applications used. The software is provided to the users so cost is not an issue in the users' decision. Training is also provided. We look at demographic information as well as social network information to determine if there are any patterns. We examine email applications, office applications (word processing, spreadsheet, etc.) and department specific software (financial, manufacturing, etc.)

INTRODUCTION

Technology adoption and diffusion has been the topic of many studies (Attewell 1992, Bajaj 1998, Christie 1994, Downs 1976, Fichman 1993, Grover 1993, Huff 1991, Igbaria 1997, Kwon 1980, Lind 1989, Rogers 1995, Thong 1995, Tornatzky 1982).

Regardless of the quality of the applications, people are often still unwilling to use the applications. Consequently, much research has been devoted to trying to understand and predict adoption and usage of software applications (Ajzen & Fishbein, 1980; Churchill, 1979; Davis, 1989; Moore and Benbasat, 1991; Rogers, 1995; Swanson, 1974, Tornatzky and Klein, 1982.)

This paper is unique because it specifically examines social network information unlike models such as the technology acceptance model (TAM). Additionally, it compares perceptions of the users with expectations of the managers. The model proposed in this paper specifically

examines the possible mediating effect of what software applications the users perceive they are required to use. This is important because managers are often able to influence what their employees do and what they think they should do.

Through the use of the linear assignment procedure we can evaluate not only the amount of software used, but also which specific software is used in spite of examining 24 software applications at one time.

This paper is timely because software and training are expensive. Managers can save money if they can identify and buy software the employees will use, as well as identify ways of getting employees to use the company's existing software.

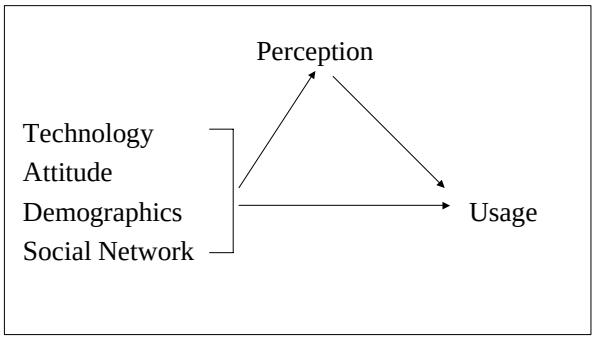

FIGURE 1: USAGE MODEL

MODEL AND HYPOTHESES:

TECHNOLOGICAL FACTORS

For the purposes of this study, we are only evaluating software applications that were developed by software companies. That is to say, we are not examining the usage of any "in-house" software. As such, we make some assumptions regarding the quality of the software. We believe it to be that case that while the software may not be completely bug-free, it meets standards of quality allowing it to be marketed and distributed to a wide audience of companies.

We presuppose also, that the functionality of the software is such that meets purchase requirements of the company. These assumptions having been stated, there are other issues yet to be addressed. In particular, we will examine issues of ease of use, and usefulness.

Many researchers have noted the importance of ease of use, or complexity, in the decision to use software (Tornatzky and Klein, 1982; Downs and Mohr, 1976; Huff and McNaughton, 1991; Fichman, 1993; Davis, 1989; Davis, Bagozzi and Warshaw, 1989; Rogers, 1995; Igbaria, Zinatelli, Cragg, and Cavaye, 1997; Kwon and Zmud, 1987; and Goodwin, 1987). Specifically, it has been shown that the complexity of the innovation has a significant negative relationship with adoption of the new application (Tornatzky and Klein, 1982; Rogers, 1995; Igbaria, Zinatelli, Cragg, and Cavaye, 1997). Goodwin (1987) thoroughly examines functionality and usability. She asserts that usability is an integral part of system design, and contributes to overall functionality. Poor usability may jeopardize the usage of a system as users make give up on it because they find it too difficult. Huff and McNaughton (1991) recognized the need for ongoing training and support to guide users with software perceived as being difficult to use.

Davis (1989) showed that perceived usefulness and ease of use are each highly correlated with self-reported use and future use. Ease of use appears to be a causal antecedent of usefulness, with little direct effect on use.

Many researchers have noted the importance of usefulness, or relative advantage, in the usage decision (Tornatzky and Klein, 1982; Downs and Mohr, 1976; Huff and McNaughton, 1991; Fichman, 1993; Davis, 1989; Davis, Bagozzi and Warshaw, 1989; Rogers, 1995; Igbaria, Zinatelli, Cragg, and Cavaye, 1997; Kwon and Zmud, 1987; and Goodwin, 1987).

Tornatzky and Klein (1982) find that relative advantage (usefulness) of a particular software application has a constant significant relationship to adoption. Rogers (1995) also finds

that the relative advantage, as perceived by the users, is positively related to the innovation's rate of adoption. He discusses some forms of incentives that may provide that relative advantage mentioned. Huff and McNaughton (1991) found that while the users perceived the usefulness of the software, the benefits of using the system needed to be communicated further to the users.

Kwon and Zmud (1987) also note the importance of relative advantage and complexity of the software. They find that lack of skill and knowledge is the primary factor behind efforts to resist using the innovation. However, they find counter examples to both of the conclusions stated above.

TAM, the technology acceptance model, posits that two constructs, perceived ease of use, and perceived usefulness, mediate all other external variables likely to influence adoption and usage decisions by the individual (Mathieson, 1991).

Hypothesis 1: People are more likely to use software they perceive is easy to use and useful for performing job tasks.

ATTITUDINAL FACTORS

Lee, Kim, and Lee (1995) look at the role of training in user acceptance of new technology. They assert that proper training can ameliorate individual differences while increasing job satisfaction, information system satisfaction and acceptance, end-user ability, and system utilization. Huff and McNaughton (1991) also recognized the need for ongoing training and support to guide users with software perceived as being difficult to use.

Rogers (1995) categorizes adopters. He contends early adopters have attitudes different from later adopters. These attitudes include greater empathy, less dogmatic, greater rationality and ability to deal with abstractions. Additionally, he asserts early adopters have greater intelligence, as well as a more favorable attitude toward change and science, higher aspirations,

higher ability to cope with uncertainty and risk. These attitudinal characteristics distinguish early adopters from the others.

Many authors have examined the role of attitude in the usage of software applications (Fishbein and Ajzen, 1974; Chaiken and Stangor, 1987; Monge and Contractor, 1997; Fulk, 1995; Fulk, 1981; Rice and Aydin, 1991; Burkhardt and Brass, 1990; Bem, 1967; Davis, Bagozzi, and Warshaw, 1989; Melone, 1990; Mathieson, 1991; Bajaj and Nidumolu, 1998). Prior attitudes influence usage of the new technology (Chaiken and Stangor, 1987; Fishbein and Ajzen, 1974). Positive user attitudes are key to the success of a new information system (Rice and Aydin, 1991; Burkhardt and Brass, 1990).

The theory of planned behavior (TPB) is used as a predictor of user intentions. The technology acceptance model (TAM) uses expectancy value (Mathieson, 1991). TPB and TAM have been able to predict information systems usage in specific situations. TAM, as discussed in the prior section, asserts usage can be predicted based on ease of use and usefulness, and usefulness influences attitude. TPB also asserts attitude influences behavioral intentions and consequently usage of the new technology. The theory of reasoned action (TRA) is another model used to predict system usage. Bajaj and Nidumolu (1998) and Melone (1990) build upon TAM, TRA, TPB, as well as cognitive dissonance and self-perception theories in determining attitude and usage. Often users of new technology experience cognitive dissonance in understanding the benefits of using the new technology, while still being resistant to change and uncertainty (Bem, 1967).

The user's current level of satisfaction with computers and technology influence their future usage of new technology and software. Burkhardt (1994) suggests attitude toward computers is the most important aspect of a successful human-computer relationship. She also

discusses self-efficacy as an important determinant of successful computer adoption. Self-efficacy regarding computer usage is an individual's belief regarding his or her ability to successfully master a computer. Burkhardt and Brass (1990) found those users who are already quite adept with the technology are more likely to use the new technology.

We'll operationalize "favorable attitudes" with the following factors: training, early adoptor, attitude toward new technology, and like using computers.

Hypothesis 2: People who have favorable attitudes towards computer technology are likely to use more software.

DEMOGRAPHIC FACTORS

Many assumptions of use have been based on stereotypes of age and education. A higher degree of formal education is thought to increase software application usage. Danowski (1984) finds more innovative individuals have more education. Fichman (1993), Rogers (1995), and Huff and McNaughton (1991) support this argument. Kwon and Zmud (1987) found mixed results: in the innovation/adoption literature, education is positively related, but has some negative associations with usage based on information systems studies.

Older people are often categorized as being more resistant to using new technology. Huff and McNaughton (1991) and Fichman (1993) contend that heavy users can be distinguished from lighter users according to their age. However, Rogers (1995) finds earlier adopters are not different from later adopters in age.

Job tenure has mixed results as a predictor of usage. Kwon and Zmud (1987) evaluate job tenure. Consistently positive relationships with adoption and job tenure have been found between in innovation research. However, in the information systems literature, negative

associations have been reported with usage. Burkhardt (1994) found tenure to be negatively related to hours of computer use.

Hypothesis 3: People with favorable demographic characteristics (more education, younger, a longer tenure at the company) are likely to use more software.

SOCIAL NETWORK FACTORS

GENERAL SOCIAL NETWORK

Social network structures are rarely examined in technology adoption studies. However, Rogers (1995, 1979) specifically recommends network study. Network analysis has unique advantages for the study of the diffusion of innovations. Study of the communication patterns provides useful information on adoption patterns. The diffusion of an innovation occurs essentially when on individual communicates and new idea to one or more other individuals. Researchers tend to argue that the shape of the social network affects the rate at which information diffuses. However, it is unclear whether information systems will replace or enhance existing social networks (Carley, 1996).

FRIENDSHIP AND CO-WORKER NETWORK

There are many studies that show the influence of the formal (co-worker) and informal (friendship) networks in the adoption and usage of new technology (Monge and Contractor, 1997; Fulk, 1993; Rice and Aydin, 1991; Burkhardt, 1994; Fichman, 1993; Granovetter, 1983; Krackhardt, 1994; Coleman, Katz, and Menzel, 1957; Lind, Zmud, and Fischer, 1989; Kwon and Zmud, 1987; Rogers, 1995; Kraut, Rice, Cool, and Fish, 1997; Sproul and Kiesler, 1991; Brinton, Budiu, Kastelic, and Slavkovic, 1998; Barley, 1990; Kilduff and Krackhardt, 1994; Carley, 1991; Krackhardt and Carley, 1998; Hansen, 1999).

Usage of the new technology is based not only on how many of the individual's peers use the new technology, but also on the proximity of these peers (Fichman, 1993; Krackhardt, 1994; Granovetter, 1983; Rogers, 1995; Attewell, 1992).

Fulk (1993) shows that individuals' attitudes and use of software was significantly influenced by the attitudes and use of the users' supervisors and five closest coworkers. Other studies (Burkhardt, 1994; Kwon and Zmud, 1987; Rice and Aydin, 1991; Kraut, Rice, Cool, and Fish, 1997) reiterate that people tend to adopt the views and actions of those with whom they associate. Individuals develop their attitudes and behaviors in part through their patterns of interaction. Both the formal structure and the informal structure are important (Krackhardt and Carley, 1998). We will specifically examine friends and coworkers.

Hypothesis 4: People are more likely to use software that their peers at work use.

POWER AND CENTRALITY

Power and centrality are related concepts. Typically, those individuals who are more central in the social network are considered more powerful. Two common measures of centrality are degree and betweenness (Freeman, 1979; Krackhardt, 1987a, 1990).

Mclaughlin and Webster (1998) found a reluctance to adopt new technology based on the professionals' fear of loss of status and power due to the automation of their tacit knowledge and specialist expertise.

The causality of the relationship between power and early adoption is debatable. Burkhardt and Brass (1990) find that early adoption is based on individual characteristics rather than being central or powerful. Then the early adopters tend to gain power. Danowski (1984) also finds isolates (those not central) in the social network tend to be earlier adopters. Burt

(1987) agrees that personal preference is the predominant determining factor of adoption, although proximity and structural equivalence are important.

Coleman, Katz, and Menzel (1957) find that individuals that are highly integrated into a social system are quicker to adopt than individuals who are isolated from the group. Isolates were less influenced by others and learned about the innovation from outside sources.

Hypothesis 5: People with a high centrality (degree and betweenness) in the social network are likely to use more software.

PERCEPTION FACTORS

W.I. Thomas said "perceptions are real in their consequences, even if they do not map one-to-one onto observed behaviors" (as quoted in Krackhardt, 1987a). Several studies have examined the effect of cognition/perception on behavior (Monge and Contractor, 1997; Bem, 1967; Jones and Day, 1997; Stapel and Koomen, 1997; Tetlock, 1983). Tetlock (1983) discusses accountability and complexity of thought. People basically are cognitive misers and don't think when they don't have too. They often change their opinions to match others. Bem (1967) evaluates cognitive dissonance. He asserts that people are uncomfortable with two dissonant cognitions and will strive to alter one of these cognitions. This reasoning would argue that people will not intentionally act counter to what they believe to be correct.

We would like to add to the few studies that examine the influence of managers on adoption (Igbaria, Zinatelli, Cragg, and Cavaye, 1997; Fichman, 1993; Leonard-Barton, 1987). The general finding is that management support is a key factor affecting system success. Fichman (1993) contends that management can encourage adoption explicitly through expressed preferences and mandates. In addition, the manager may be able to influence usage through rewards, incentives, providing resources. He asserts that studies of individual adoption within an

organization must either incorporate managerial influences into the analysis or account for them as potential confounding factors.

Hypothesis 6: People are more likely to use software they perceive they are required (by a supervisor) to use.

DATA:

Although Bernard, et. al, (1984) found that people are inaccurate when recalling and reporting information, Freeman, et. al, (1987) reassure us that most people are able to accurately recall a pattern of repeated interactions over a period of time. These results allow researchers to use information gleaned from surveys. We used the sociometric method of measuring network links by asking respondents whom they sought for information about given topics.

We administered the survey to a not-for-profit company in Pittsburgh. We were able to get all of the 76 computer users in the organization to respond. We are grateful for the support of the president and CEO of the company. We selected this company for several reasons. This company was a good match for our study because it had a wide range of demographics among the computer users. There was also wide variation in computer proficiency among the users. Software and training were provided at no cost to the users. The primary function of the business was not computer-related. However, computer usage was critical to achieve the business goals. A sample copy of the survey is shown in the appendix.

TABLE 1
Factors and Their Measurement Constructs

Factor	**Measurement Construct**
Easy	Put a check by all software applications you consider easy to use.
Useful	*Put a check by all software applications you consider useful for performing job tasks.*
Train	*I receive adequate training for new applications*. (Likert scale 1-7)
Early Adopter	*I am typically one of the first (last) in my group to start using a new application*. (Likert scale 1-7, both questions—first and last--asked to verify understanding)

Attitude	Factor analysis of a series of questions about their attitudes toward the brand new phone system and the option many had to receive a laptop computer.
Like	*How much do you like using a computer*? (Likert scale 1-7)
Education	*Highest level of education achieved* (circle category).
Age	*Age* (grouped in 10 year increments).
Tenure	*Years at the company*.
Friends	*Select the names of the individuals whom **you go to** for help or information regarding non-work-related topics. This could include information about taxes, parking, post office, vacation planning, restaurants, home repairs, movies, etc.*
Co-workers	*Select the names of the individuals **you could cover for** while they are on vacation. Select the names of the individuals who could **cover for you** while you are on vacation.* Both questions asked to confirm results.
Degree Centrality	Degree centrality analysis of the social network as determined in the "friends" question.
Betweenness	Betweenness analysis of the social network as determined in the "friends" question.
Required Software	*Put a check by all software applications you consider yourself required by your supervisor to use*.

TABLE 2
Descriptive Statistics of Variables

Factor	Mean	Standard Deviation	Minimum	Maximum	Median
Usage	4.316	2.328	0	14	4
Easy	2.934	2.100	0	9	3
Useful	3.737	2.100	0	10	4
Train	4.066	1.769	1	7	4
Early Adopter	1.882	2.688	-4	6	2
Attitude	0.395	0.492	0	1	0
Like	5.842	1.212	2	7	6
Education	2.513	1.183	1	4	3
Age	3.974	1.166	2	6	4
Tenure	10.325	9.610	0.1	37	8
Friends	7.697	7.556	0	33	6
Co-workers: I cover (Cover me)	4.618 (3.000)	4.427 (2.349)	0 (0)	18 (15)	3 (2.5)
Degree Centrality (Normalized)	15.342 (20.456)	9.774 (13.032)	0 (0)	45 (60)	13 (17)
Betweenness (Normalized)	92.263 (1.662)	162.880 (2.935)	0 (0)	871.252 (15.698)	28 (0.5)
Perceived Required	1.368	2.025	0	11	0

RESULTS:

PART 1: Amount of Software Used

TABLE 3
Correlation Matrix of Factors Influencing the Amount of Software Used and Perceived Required

	Usage	Easy	Useful	Training	Early	Attitude	Like	Education	Age	Tenure	Degree	Between
Easy	0.651***											
Useful	0.808***	0.749***										
Training	0.076	-0.013	-0.056									
Early	0.522***	0.455***	0.547***	0.049								
Attitude	0.204	0.116	0.166	0.200	0.368***							
Like	0.448***	0.247*	0.460***	-0.039	0.404***	0.195						
Education	0.168	0.245*	0.141	-0.112	-0.073	0.037	-0.045					
Age	-0.169	-0.202	-0.155	0.066	-0.133	-0.144	-0.050	0.010				
Tenure	0.032	0.032	0.000	-0.117	-0.015	-0.107	0.065	-0.115	0.373***			
Degree	0.185	0.171	0.241*	0.088	-0.075	-0.092	0.068	-0.094	0.111	0.218*		
Between	0.006	0.142	0.012	0.162	0.086	0.076	0.220*	0.055	0.006	-0.031	0.010	
Perceived Required	0.521***	0.476***	0.484***	0.042	0.427***	0.240*	0.296**	0.048	-0.013	0.005	0.212	-0.035

In most cases, there is a very high correlation between *usage* and *perceived required.* Therefore, the supporting literature is relevant here for both aspects of analysis.

Technology

Hypothesis 1a. People are more likely to use more software if they perceive more software is easy to use and/or useful for performing job tasks. *Supported.*

As expected, users are more likely to use more software if they find software easy to use. We find, like Tornatzky and Klein (1982), Kwon and Zmud (1987), and Rogers (1995), a negative association between complexity and usage. As Goodwin (1987) found, a system with poor usability is not likely to be used.

Similarly, usage is increased when software is considered useful in performing job tasks. Downs and Mohr (1976) and Huff and McNaughton (1991) assert relative advantage determines usage. We found this to be the case in this study. Rogers (1995) also contends that usefulness is one of the best predictors of usage.

Our findings specifically support Davis (1989), Goodwin (1987) and Igbaria, Zinatelli, Cragg, and Cavaye (1997) who found that perceived ease of use is a dominant factor in explaining perceived usefulness and system usage, and that perceived usefulness had a stong effect on system usage. Davis even asserts that ease of use has little direct effect on usage, rather ease of use is a causal antecedent of usefulness, which then influences usage.

When combining these two factors, *easy* and *useful*, it becomes clear that the dominant factor is *useful*. The high correlation between *easy* and *useful* (0.749 with a p-value less than 0.001) may account for some of the influence of *easy*.

These results support our findings in the set of tables below which show the perception of required software didn't mediate the amount of software used based on the technological factors of *easy* and *useful*.

The relevant correlations are contained in Table 3 above. All are quite high and significant at the 0.001 level. The correlation between *useful* and *usage* (0.808) is the highest, but *easy* and *usage* also are highly correlated (0.651).

TABLE 4A
Regression Results of Technological Factors Influencing the Amount of Software Used

Usage	Easy	Useful	Combined Model
Intercept	2.199	0.968	0.952
Easy	0.721***	---	0.115
Useful	---	0.896***	0.809***
R-squared	0.424	0.653	0.658

*p<.05 **p<.01 ***p<.001

TABLE 4B
Regression Results of Technological Factors Influencing the Amount of Software Used Accounting for the Perception of Required Software

Usage	Easy	Useful	Combined Model
Intercept	2.192	1.041	1.028
Perc. Required	0.314**	0.195*	0.184*
Easy	0.578***	---	0.069
Useful	---	0.805***	0.758***
R-squared	0.481	0.675	0.677

*p<.05 **p<.01 ***p<.001

TABLE 4C
Regression Results of Technological Factors Influencing the Amount of Software Perceived Required

Perc. Required	Easy	Useful	Combined Model
Intercept	0.021	-0.376	-0.409
Easy	0.459***		0.249
Useful		0.447***	0.279*
R-squared	0.226	0.234	0.264

*p<.05 **p<.01 ***p<.001

Attitude

Hypothesis 2. People who have favorable attitudes towards computer technology are likely to use more software. *Supported, except for the "training" factor*.

Although the users considered their training adequate, it did not have a significant influence on usage. While the respondents indicated that their training classes were useful, sufficient training was not a significant predictor of usage in general. This is in contrast to the literature (Lee, Kim, and Lee, 1995; Huff and McNaughton, 1991) that asserts that proper training can increase information system satisfaction and acceptance and system utilization. Perhaps the users are unaware that their training is not sufficient and they would realize the benefits of additional training.

However, as expected (Rogers, 1995), those users that considered themselves "early adopters" were likely to use more software. Additionally, participants with a favorable attitude toward new technology and who indicated they liked using a computer were more likely to use more software applications. These results are in accordance with the predominant thought in the current literature (Burkhardt, 1994; Burkhardt and Brass, 1990).

When these four factors are evaluated together, the clearly dominant factor is the *early adopter* factor, with *like* of computers also being significant. *Attitude* drops out of significance

and becomes negative. We can see that adding *perceived required* into the regression model, it becomes the most significant variable. We can see partial mediation by *perceived required* when evaluating attitudinal factors' influence on usage. When perceived required is added to the regression, the mediating effect is that the *attitude* variable loses its significance. The *early adopter* variable is not mediated by *perceived required* when regressed in the two variable model, nor is the *like* variable. However, when the combined model is regressed, the significance level of *early adopter* drops one level and is partially mediated by *perceived required*.

The follow set of tables show the results of the regression of the attitudinal factors.

TABLE 5A
Regression Results of Attitudinal Factors Influencing the Amount of Software Used

Usage	Training	Early Adopter	Attitude	Like	Combined Model
Intercept	3.910	3.466	4.067	-0.714	0.065
Training	0.099	---	---	---	0.087
Early	---	0.452***	---	---	0.341***
Attitude	---	---	0.094*	---	0.011
Like	---	---	---	0.861***	0.553**
R-squared	0.006	0.272	0.048	0.448	0.345

*p<.05 **p<.01 ***p<.001

TABLE 5B
Regression Results of Attitudinal Factors Influencing the Amount of Software Used Accounting for the Perception of Required Software

Usage	Training	Early Adopter	Attitude	Like	Combined Model
Intercept	3.209	3.146	3.372	0.029	0.327
Perc. Required	0.596***	0.419***	0.575***	0.489***	0.380***
Training	0.071	---	---	---	0.087
Early	---	0.317***	---	---	0.256**
Attitude	---	---	0.396	---	-0.213
Like	---	---	---	0.619***	0.465**
R-squared	0.274	0.381	0.278	0.366	0.431

*p<.05 **p<.01 ***p<.001

TABLE 5C
Regression Results of Attitudinal Factors Influencing the Amount of Software Perceived Required

Perc. Required	Training	Early Adopter	Attitude	Like	Combined Model

Intercept	1.175	0.763	0.978	-1.519	-0.713
Training	0.048				0.015
Early		0.322***			0.254**
Attitude			0.988*		0.351
Like				0.494**	0.240
R-squared	0.002	0.182	0.058	0.087	0.207

*p<.05 **p<.01 ***p<.001

Demographic

Hypothesis 3: People with favorable demographic characteristics (more education, younger, a longer tenure at the company) are likely to use more software. *Not supported.*

As expected, there is a negative influence of *age* on usage. However, it was not a significant influence. We see a slight suppressor of the *perceived required* variable because the *age* coefficient becomes significant, but the value decreases. Colinearity has reduced the standard error. Respondent *education*, *age*, and *tenure* at the company did not have a significant effect on *usage*. The education result is in contrast to the current literature which asserts *education* should have a positive effect on *usage* (Danowski, 1984; Fichman, 1993; Rogers, 1995; Huff and McNaughton, 1991), although Kwon and Zmud (1987) found mixed results. The influence of *age* and *tenure* both had contradictory findings in the literature (Huff and McNaughton, 1991 ; Fichman, 1993; Rogers, 1995; Kwon and Zmud, 1987; Burkhardt, 1994). Our results add to the "no effect" portion of the literature.

Again, we can see that by adding *perceived required* into the regression model, it becomes the most significant variable. The results of the regressions of *usage* and the demographic variables are shown the set of tables below.

TABLE 6A
Regression Results of Demographic Factors Influencing the Amount of Software Used

Usage	Education	Age	Tenure	Combined Model
Intercept	3.486	5.655	4.235	4.18
Education	0.099	---	---	0.366
Age	---	-0.337	---	-0.442

Tenure	---	---	0.008	0.033
R-squared	0.028	0.029	0.001	0.07

*p<.05 **p<.01 ***p<.001

TABLE 6B
Regression Results of Demographic Factors Influencing the Amount of Software Used Accounting for the Perception of Required Software

Usage	Education	Age	Tenure	Combined Model
Intercept	2.799	4.787	3.422	4.081
Perc. Required	0.591***	0.596***	0.598***	0.586***
Education	0.282	---	---	0.315
Age	---	-0.324	---	-0.422*
Tenure	---	---	0.007	0.031
R-squared	0.292	0.298	0.272	0.332

*p<.05 **p<.01 ***p<.001

TABLE 6C
Regression Results of Demographic Factors Influencing the Amount of Software Perceived Required

Perc. Required	Education	Age	Tenure	Combined Model
Intercept	1.162	1.457	1.358	1.251
Education	0.082			0.086
Age		-0.022		-0.035
Tenure			0.001	0.004
R-squared	0.002	0.000	0.000	0.030

*p<.05 **p<.01 ***p<.001

Social Network

We used the quadratic assignment procedure (QAP) correlation and MRQAP (multiple regression QAP) for this section on social network analysis. Specifically, we used the software package UCINet 5.0 (Borgatti, Everett, and Freeman, 1999). The QAP is a nonparametric, permutation-based test (Krackhardt, 1987b). Unlike ordinary least squares (OLS) it allows us to preserve the integrity and interdependency of the observed structures. Network data consists of dyadic relationships that cannot be assumed to be independent of one another. Similarly, MRQAP is the preferred multiple regression model for network analysis because of the structural autocorrelation in the data (Krackhardt, 1988).

TABLE 7
Correlation Matrix of Factors Influencing the Specific Software Used and Perceived Required

Correlation Matrix	Usage	Friends	I Cover	Cover Me
Friends	0.037			
I Cover	0.006	0.294***		
Cover Me	0.047**	0.347***	0.545***	
Perceived Required	0.167**	0.053*	0.043*	0.033*

*p<.05 **p<.01 ***p<.001

See Figure 3 in the appendix for a graphical representation of the informal social network.

Hypothesis 4a: People are more likely to use software that their peers at work use. *Mixed support.*

It is surprising that the friendship network didn't influence that amount of software used because the current literature suggests that it should (Monge and Contractor, 1997; Fulk, 1993; Rice and Aydin, 1991; Burkhardt, 1994; Fichman, 1993; Granovetter, 1983; Krackhardt, 1994; Coleman, Katz, and Menzel, 1957; Lind, Zmud, and Fischer, 1989; Kwon and Zmud, 1987; Rogers, 1995; Kraut, Rice, Cool, and Fish, 1997; Sproul and Kiesler, 1991; Brinton, Budiu, Kastelic, and Slavkovic, 1998; Barley, 1990; Kilduff and Krackhardt, 1994; Carley, 1991; Krackhardt and Carley, 1998; Hansen, 1999). However, the formal network (coworker ties) did influence usage as the literature indicates.

When evaluating the combination of people "*I cover*" and people that "*cover me*" we see a significant result that is not mediated by perceived *required*. On the other hand, the *I cover* variable, which is very small and negative, is not significant. People tended to use the same amount of software they thought people that covered for them used. However, they did not tend to use the same amount of software used by people they covered for. These results imply a bias whereby individuals believe that anyone who can cover for them needs to be using the software that individual uses. However, that same individual does not feel responsible to be using the

software of the people they could cover for. This could imply some sort of status effect. Additionally, the combined model shows that the *cover me* variable is more significant than friends and whom *I cover*.

Yet again, we can see that adding *perceived required* into the regression model, it becomes the most significant variable. The set of tables below show the specific coefficients and significance levels of regression of the social network factors upon usage.

TABLE 8A
Regression Results of Social Network Factors Influencing the Specific Software Used

Usage	Friends	I Cover	Cover Me	Coworker	Combined Model
MR Intercept	0.859	0.863	0.859	0.861	0.859
Friends	0.042	---	---	---	0.031
I Cover	0.001	0.008	---	-0.041	-0.047
Cover Me	---	---	0.083*	0.109***	0.097**
R-squared	0.001	0.844	0.002**	0.041*	0.003

*p<.05 **p<.01 ***p<.001

TABLE 8B
Regression Results of Social Network Factors Influencing the Specific Software Used Accounting for the Perception of Required Software

Usage	Friends	I Cover	Cover Me	Coworker	Combined Model
MR Intercept	0.836	0.839	0.836	0.838	0.836
Perc. Required	0.159**	0.161***	0.159**	0.160**	0.159**
Friends	0.032	---	---	---	0.022
I Cover	---	-0.002	---	-0.049	-0.056
Cover Me	---	---	0.073**	0.105***	0.097**
R-squared	0.029*	0.028*	0.030*	0.030*	0.031*

*p<.05 **p<.01 ***p<.001

TABLE 8C
Regression Results of Social Network Factors Influencing the Specific Software Perceived Required

Perc. Required	Friends	I Cover	Cover Me	Coworker	Combined Model
MR Intercept	0.143	0.146	0.147	0.145	0.141
Friends	0.063*	---	---	---	0.052
I Cover	---	0.064*	---	0.053	0.043
Cover Me	---	---	0.061*	0.026	0.004
R-squared	0.003*	0.002*	0.001	0.002*	0.004

*p<.05 **p<.01 ***p<.001

Hypothesis 5: People with a high centrality (degree and betweenness) in the social network are likely to use more software. *Not supported.*

We examined the correlations between *usage* and *in degree* centrality, as well as *usage* and *out degree* centrality. Both were small and not significant. We also examined the correlations between *perceived required* and *in degree* centrality, as well as *perceived required* and *out degree* centrality. Both, although significant, were small.

The individuals' *centrality* and *betweenness* in the social network were also non-factors in influencing software usage. This is not surprising because the causality of the relationship between centrality and usage has mixed support in the current literature. Burkhardt and Brass (1990) and Danowski (1984) tend to find that early adoption is based on individual characteristics rather than being central or powerful. Then the early adopters tend to gain power.

Although, we can see that adding *perceived required* into the regression model, it becomes the most significant variable, it has no mediating effect. The set of tables below reflect the results of the regression of the social network centrality factors upon *usage*.

TABLE 9A
Regression Results of Social Network Factors Influencing the Amount of Software Used

Usage	Degree	Between	Combined Model
Intercept	3.639	4.31	3.634
Degree	0.033	---	0.033
Betweenness	---	0.005	0.004
R-squared	0.034	0.001	0.034

*p<.05 **p<.01 ***p<.001

TABLE 9B
Regression Results of Social Network Factors Influencing the Amount of Software Used Accounting for the Perception of Required Software

Usage	Degree	Between	Combined Model
Intercept	3.238	3.464	3.208
Perc. Required	0.579***	0.599***	0.581***
Degree	0.014	---	0.018
Betweenness	---	0.019	0.014
R-squared	0.277	0.272	0.278

*p<.05 **p<.01 ***p<.001

TABLE 9C
Regression Results of Social Network Factors Influencing the Amount of Software Perceived Required

Perc. Required	Degree	Between	Combined Model
Intercept	0.693	1.407	0.733
Degree	0.033		0.033
Between		-0.024	-0.025
R-squared	0.045	0.001	0.046

*p<.05 **p<.01 ***p<.001

Perception

Hypothesis 6a. People are more likely to use more software if they perceive they are required (by a supervisor) to use more software. *Supported*.

As expected, we see a highly significant coefficient. Our results support the current literature which states that people will not intentionally act counter to what they believe to be correct (Monge and Contractor, 1997; Bem, 1967; Jones and Day, 1997; Stapel and Koomen, 1997; Tetlock, 1983). Additionally, people act upon what they perceive, even if their perceptions are incorrect (W.I. Thomas as quoted in Krackhardt, 1987a).

The table below shows the strong and significant coefficient of the regression of *perceived required* upon *usage*.

TABLE 10
Regression Results of Perception Factors Influencing the Amount of Software Used

Usage	Perceived Required
Intercept	3.497
Perceived Required	0.599***
R-squared	0.271

*p<.05 **p<.01 ***p<.001

As indicated in Table 11, there are very few differences between the factors that influence usage amount and the amount of software perceived required.

TABLE 11
Summary of Factors Influencing Usage Amount and Perceived Amount Required

Factor	Influenced Usage Amount	Influenced Perceived Amount Required

Easy	Yes*	Yes
Useful	Yes	Yes
Training	No	No
Early Adopter	Yes	Yes
Attitude	Yes	Yes
Like Computers	Yes	Yes
Education	No	No
Age	No	No
Tenure	No	No
Friends	No	Yes
Co-worker	Mixed	Yes
Centrality	No	No
Betweenness	No	No
Perceived Required	Yes	---

*Yes if p-value < 0.05

PART 2: Specific Software Used

The analysis in the first part of this paper dealt with the amount of software used (and perceived required). In this second part we will examine the more salient issue of which specific software applications are used and what factors influence this usage.

We used the linear assignment procedure (LAP) to evaluate the correlation between usage and the variables for each specific piece of software. This is the same linear assignment function that is optimized in operations research. It provides a distributional framework relevant to a variety of data analysis situations. The actual distribution (rather than the extreme distribution) is of interest when problems of statistical inference are being considered. The data are assumed fixed and given (the matrices for the variables) and we examine whether some assignment, specified a priori (the usage matrix) could be considered a random draw from all possible assignments. (Hubert, 1987)

For all of the following linear assignment procedure analyses, our dependent variable was usage. We ran each multiple regression combination of variables with 10,000 permutations. There were a total of 1834 cell pairs for each of the matrices with 76 rows and 24 columns.

TABLE 12
Correlation Matrix of LAP Factors Influencing the Specific Software Used and Perceived Required

	Usage	Perc. Required	Easy	Useful	People Who Cover Me Use	People I Cover Use	Friends Perc. Required
Perc. Required	0.513						
Easy	0.775	0.536					
Useful	0.869	0.501	0.786				
People Who Cover Me Use	0.579	0.328	0.519	0.547			
People I Cover Use	0.555	0.296	0.507	0.490	0.764		
Friends Perc. Required	0.418	0.319	0.424	0.408	0.447	0.463	
Friends Use	0.479	0.344	0.459	0.473	0.506	0.503	0.849

Technology

Hypothesis 1b. People are more likely to use software they perceive is easy to use and/or useful for performing job tasks. *Supported.*

As expected, users will tend to use the specific software application they find easy to use. Additionally, the specific software that is considered useful is more likely to be used. As noted in the discussion of Hypothesis 1a, most of the literature in the area supports these findings (Tornatzky and Klein, 1982; Downs and Mohr, 1976; Huff and McNaughton, 1991; Fichman, 1993; Davis, 1989; Davis, Bagozzi and Warshaw, 1989; Rogers, 1995; Igbaria, Zinatelli, Cragg, and Cavaye, 1997; Kwon and Zmud, 1987; and Goodwin, 1987).

Useful is more significant than *easy* in the combined model. When *perceived required* is added to the combined model it decreases the significance level of the *easy* variable and doesn't effect *useful*. However, when *useful* and *perceived required* are regressed without the easy variable, the significance of *useful* drops a level. The *easy* coefficient decreases very slightly when *perceived required* is added to the model. The set of tables below reflect the specific coefficients and significance levels.

TABLE 13A
Regression Results of Technological Factors Influencing the Specific Software Used

Usage	Easy	Useful	Combined Model
MR Intercept	0.069	0.364	0.033
Easy	0.909***	---	0.281**
Useful	---	0.921***	0.722***
R-squared	0.601	0.757	0.779

*p<.05 **p<.01 ***p<.001

TABLE 13B
Regression Results of Technological Factors Influencing the Specific Software Used Accounting for the Perception of Required Software

Usage	Easy	Useful	Combined Model
Intercept	0.066	0.035	0.033
Perc. Required	0.226**	0.171*	0.102
Easy	0.823***	---	0.254**
Useful	---	0.867**	0.708***
R-squared	0.066	0.765	0.781

*p<.05 **p<.01 ***p<.001

Social Network

Hypothesis 4b. People are more likely to use software that their peers use. S*upported.*

The combined model shows that "*friends perceive required*" variable's significance completely drops out and that the "*friends use*" variable is the indicator of usage of specific software. *Perceived required* does not mediate. Results are shown in the set of tables below.

TABLE 14A
Regression Results of Informal Social Network Factors Influencing the Specific Software Used

Usage	Friends Perc. Required	Friends Use	Combined Model
Intercept	0.117	0.095	0.095
Friends Perc. Required	0.129***	---	0.013
Friends Use	---	0.058***	0.054***
R-squared	0.175	0.229	0.230

*p<.05 **p<.01 ***p<.001

TABLE 14B
Regression Results of Informal Social Network Factors Influencing the Specific Software Used

Usage	Friends Perc. Required	Friends Use	Combined Model
Intercept	0.098	0.082	0.082

Perc. Required	0.699***	0.654***	0.653
Friends Perc. Required	0.088***	---	0.001
Friends Use	---	0.041***	0.041**
R-squared	0.335	0.367	0.367

*p<.05 **p<.01 ***p<.001

Both the "*Cover me use*" and "*I cover use*" variables are significant and unmediated by *perceived required*.

Based on the literature, we would expect the hypotheses to be supported. Individuals develop their attitudes and behaviors in part through their patterns of interaction. Both the formal and informal structure are important in the adoption and usage of new technology (Monge and Contractor, 1997; Fulk, 1993; Rice and Aydin, 1991; Burkhardt, 1994; Fichman, 1993; Granovetter, 1983; Krackhardt, 1994; Coleman, Katz, and Menzel, 1957; Lind, Zmud, and Fischer, 1989; Kwon and Zmud, 1987; Rogers, 1995; Kraut, Rice, Cool, and Fish, 1997; Sproul and Kiesler, 1991; Brinton, Budiu, Kastelic, and Slavkovic, 1998; Barley, 1990; Kilduff and Krackhardt, 1994; Carley, 1991; Krackhardt and Carley, 1998; Hansen, 1999).

The set of tables below show the results of the regression of the formal social network (coworker) factors upon usage.

TABLE 15A
Regression Results of Formal Social Network Factors Influencing the Specific Software Used

Usage	Cover Me Use	I Cover Use	Combined Model
Intercept	0.078	0.095	0.073
Cover Me Use	0.169***	---	0.109***
I Cover Use	---	0.115***	0.056***
R-squared	0.335	0.308	0.366

*p<.05 **p<.01 ***p<.001

TABLE 15B
Regression Results of Formal Social Network Factors Influencing the Specific Software Used

Usage	Cover Me Use	I Cover Use	Combined Model
Intercept	0.064	0.076	0.061
Perc. Required	0.599***	0.633***	0.579***

Cover Me Use	0.135***	---	0.084***
I Cover Use	---	0.091***	0.048***
R-squared	0.451	0.441	0.474

*p<.05 **p<.01 ***p<.001

The results of the regression model of both the formal and informal social network factors are shown in the table below.

TABLE 16
Regression Results of Social Network Factors Influencing the Specific Software Used

Usage	Social Network Variables	Combined Model
Intercept	0.055	0.049
Perc. Required	---	0.537***
Cover Me Use	0.090***	0.073***
I Cover Use	0.044***	0.041***
Friends Perc. Required	-0.002	-0.009
Friends Use	0.027*	0.020
R-squared	0.399	0.488

*p<.05 **p<.01 ***p<.001

The combined model shows that co-worker usage is more indicative of usage than is friend usage.

Surprisingly, the social network influenced specific software application usage only indirectly. One would anticipate that individual's would tend to use the same software applications as their friends because they would have positive reinforcement and a built-in support system. We did not find this to be the case. However, this friendship network did influence the perception of required software. Friends tended to perceive the same software applications were required. Because respondents were more likely to use software they perceived they were required by their supervisor to use, there is this indirect effect on usage of the social network structure. Usage of specific software applications was also increased by the perception that the supervisor encouraged them to use the software.

Perception

Hypothesis 6b. People are more likely to use software they perceive they are required (by a supervisor) to use. *Supported.*

The coefficient of the regression of perceived required on usage was very high (0.849) and also highly significant (see Table 17).

We anticipated a similar result based on the literature. People are uncomfortable with two dissonant cognitions, so the will try to minimize this dissonance. This means that people will use the software they believe they are required to use (Monge and Contractor, 1997; Bem, 1967; Jones and Day, 1997; Stapel and Koomen, 1997; Tetlock, 1983). We will examine the accuracy of these perceptions in the next section of this paper.

TABLE 17
Regression Results of Perception Factors Influencing the Specific Software Used

Usage	Perceived Required
MR Intercept	0.131
Perceived Required	0.849***
R-squared	0.263

*p<.05 **p<.01 ***p<.001

TABLE 18
Regression Results of Factors Influencing the Specific Software Perceived Required

Usage	**Full Model**
Intercept	0.021
Per. Req.	0.098
Easy	0.202*
Useful	0.662***
Cover Me Use	0.011
I Cover Use	0.022*
Friends Perc. Required	-0.006
Friends Use	0.003
R-squared	0.796

*p<.05 **p<.01 ***p<.001

When evaluating the full model (Table 18), it is readily apparent that the most significant factor is *useful*. *Easy* and "*I cover use*" are also significant.

TABLE 19
Summary of Factors Influencing Specific Software Usage and Specific Software Perceived Required

Factor	Specific Software Usage	Specific Software Perceived Required
Easy	Yes	Yes
Useful	Yes	Yes
Friends Perc. Required	Yes	Yes
Friends Use	Yes	Yes
I Cover for Use	Yes	Yes
Cover for Me Use	Yes	Yes
Perceived Required	Yes	----

*Yes if p-value < 0.05

PART 3: Perceived Required vs. Actual Required Discrepancy

TABLE 20
Summary of Software Usage Categories Examined Perceived and Actual Required

Total of all users and all software applications (users with at least one app, N=76)	Percentage (with 76 users and 24 software applications)	Category of software usage (use, perceived required, actually required) *
83 (54%)	4.55%	1. Y, Y, Y
146 (74%)	8.00%	2. Y, N, Y
18 (12%)	0.98%	3. Y, Y, N
94 (49%)	5.15%	4. Y, N, N
2 (3%)	0.11%	5. N, Y, Y
133 (84%)	7.29%	6. N, N, Y
0 (0%)	0.00%	7. N, Y, N
1347 (100%)	73.91%	8. N, N, N

*Interpretation of each category from user perception:

1. I use what I think I am required (actually is required).
2. I use it even though I am not required (but actually is required).
3. I'm overworked using all the software I am required to use (but is actually not required).
4. I use it for fun because I know it is not required (actually not required).
5. I know I am required to use it but I don't anyway (actually is required).
6. I don't use it because I am not required (but actually is required).
7. I'm not going to use it even though I think it is required (but is actually not required).
8. I don't use it because I know it is not required (actually not required).

Categories of concern are 2 and 6 because they both think the software is not required when it actually is. Category 2 people use the software anyway, but feel they are doing the organization a favor. People in category 6 are not aware that they are supposed to be using the software. Certain departments had much higher percentages of category 6's than others.

Category 5 people are of some concern because they knowingly ignore the requirement for use. However, they constitute a very small percentage of the user total. Through interviews it was discovered that these two individuals cared very little about what they knew they were required to use.

Evaluating usage based on perceptions of required (regardless of whether it actually is required or not) we find that people in general use what they think they are supposed to. Categories 1 and 3 (54% and 12% of all respondents, respectively) use what they think they are supposed to use. Categories 5 and 7 (3% and 0% of all respondents, respectively) do not use what they think they are supposed to use. These results show very little willful rebellion.

Current literature (Igbaria, Zinatelli, Cragg, and Cavaye, 1997; Fichman, 1993; Leonard-Barton) suggests that management support is a key factor affecting system success, and management can encourage adoption explicitly through expressed preferences and mandates. It is crucial for the managers to clearly express which software is required.

DISCUSSION:

We found the same factors that influence usage amount are exactly the same factors that influence the perceived required-to-use software amount. There is a small variation with the factors influencing specific software usage and the perceived required-to-use software applications.

We looked specifically at perceived required software vs. actual required (by supervisor) software. We found distinct differences. In general, people thought they were being more than compliant. However, based on actual requirements, most were falling short. Of 76 users, 64 (84%) of them had at least one software application that they didn't use because they thought they were not required to, when they actually were required to use the software. Certain

departments had a much higher rate of this occurrence than others. It would appear that the reason for lower usage of software is due to the mistaken perception of which software the users are actually required to use.

Mclaughlin and Webster (1998) found a reluctance to adopt new technology based on the professionals' fear of loss of status and power due to the automation of their tacit knowledge and specialist expertise. As such, technology has led to a decline of professional status in many fields. While this encourages multidisciplinary work and is more inclusive, many professionals feel threatened. Mclaughlin and Webster perceive that professional identity works to retain control and ownership over incomplete and changing bodies of knowledge.

If this were the case, we would find resentment on the part of the users because they feel the new technology poses a threat to their positions. This is the basic notion of deskilling.

We did not find this to be the case in our study. If people were willfully not using the applications, we would see more "5's" in our comparison of perceived/actual required software analysis. We find mostly "6's" which indicate the lack of use is due to ignorance of the requirement to use the software.

Through interviews at the company we found evidence of lacking support at the managerial level. Many of the managers had a negative attitude toward new technology and didn't care for new software. Consequently, these managers didn't impress upon their employees the importance of using the new software. An ameliorating factor is that some of the supervisors of the managers occasionally took control of the situation and caused the lower level managers and employees to understand that the new software was in fact required to be used. This finding is supported by Zmud (1984) who found that innovation success is positively related to the existence of favorable management attitudes toward the innovation. Implementation

success occurs when a commitment to change exists, and a commitment to the implementation effort exists (Kwon and Zmud, 1987).

Tyre and Orlikowski (1993) found that managers must actively help the organization adapt to the new technology. They assert adaptation is a "lumpy" process that requires several cycles. This requires the managers to allow plenty of time for the employees to digest the new technology and adjust to the changes. But often the implementation doesn't go according to the plan. That's when it becomes critical for the managers to be able to improvise the change management (Orlikowski and Hofman, 1997).

Another issue to consider is that fact that employees may deliberately "shirk" if their compensation is based on the results of the department rather than the individual (Kim and Parker, 1995). They may encouraged by other members of the department to control their productivity so as not make the other employees look bad or have to work harder (Roethlisberger and Dickson). If this were the case at this company, the employees would, by department, join together in "not knowing" which software they are supposed to be using. Although we have no indication of this, the possibility of its existence must be considered.

ADDITIONAL RESULTS:

We found some usage trends within and between departments. The figures referred to in the following text can be found in the appendix.

Figure 4 examines the software packages used by at least one person in a specific department. We find that all departments have some usage of the email software. Almost all departments also used Microsoft (MS) Office products as well. We can see the distribution and overlap of departmental specific software applications.

When we increase the usage threshold from one user to two users per department, we see a substantial decrease in applications used (Figure 5). Figure 6 shows what happens when the threshold is increase to 50% of the department members using a specific application. Even the MS Office application usage is severely affected.

Comparing Figure 7, the software required to be used by each department, we can see some problems. While one or two people for that department may actually be using the software, certainly nowhere near half of the department uses the software. This comparison shows why there is a concern at this company and others.

We examined usage patterns and clusters of usage. Figure 8 shows departments (with a usage threshold of two people) that use common software amongst the departmental specific software applications. We can see clusters among departments with common or similar functionality. Certain other departments are very much self-contained. Figure 9 is an alternative representation of common software usage. It shows which software packages are used together. Again we see clustering based on the general functionality of the software.

In Figure 10 we show the results of combining the common software usage by application and department. Again, the clusters show that usage is grouped by the function of the department and software. We add the interdepartmental interaction (Figure 12) to Figure 10 to get Figure 11, which represents the common software usage by application and department, and the interaction between the departments. As expected, we can see clusters along the functional lines of the organization.

MS Office products account for more than half of the software application usage. MS Office = 61.3%, email 18.3%, dept 20.4%, normalized totals: 33.5, 60, 3.94 (of 76 users). Figure

13 reflects this distribution. As expected, the MIS department has the highest total usage as well as using the greatest amount of departmental specific software.

LIMITATIONS AND FUTURE RESEARCH

This study was limited to a single snapshot of usage. Perhaps we would see some usage trends develop if we were to examine this company over a period of time. More recent interviews with employees of the company have shown a higher level of usage of many of the software applications over the past year since the survey was administered.

An interesting addition to this research would involve evaluating the usage of competing software applications. For example, if two word processing programs were offered to the users, would one be used more than another, and if so why?

Another area to study is the relationship between the usage of different software packages. For example, if a user uses Software A, how likely is that same user to use Software B? Or, of a certain number of users of Software B, how many also use Software A?

CONCLUSIONS

It appears that the easiest way to increase software application usage is to simply ensure that managers communicate which software applications the users are required to use. It would be wise to follow up to guarantee the employees really do understand which applications they are required to use. We predict that increased awareness of what is required, as well as training and support by management, can increase software usage and consequently productivity.

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APPENDIX

SAMPLE SURVEY:
NAME: _____

1. Please put a check by the names of the individuals *whom you go to* for help or information regarding work-related topics—divided into computer specific information and non-computer information.

Computer-related Advice	*Non Computer-related Advice*
____ Person A	____
____ Person B	____
____ Person C	____
____ etc.	____

2. Please put a check by the names of the individuals *whom you go to* for help or information regarding non-work-related topics. This could include information about taxes, parking, post office, vacation planning, restaurants, home repairs, movies, etc.

____ Person A
____ Person B
____ Person C
____ etc.

3. Please put a check by the names of the individuals *you could cover* for while they are on vacation.

	Name	*Department*
____	Person A	Clerical
____	Person C	Clerical
____	Person B	Development
____	etc.	etc.

4. Please put a check by the names of the individuals who *could cover for you* while you are on vacation.

	Name	*Department*
____	Person A	Clerical
____	Person C	Clerical
____	Person B	Development
____	etc.	etc.

5. **Please put a check by the names of the software applications you use on a regular basis. Sometimes supervisors encourage or require use of certain applications. Please indicate in the appropriate area if this is the case. Some applications are easier to use than others—please indicate which applications you find easy to use. Some applications are useful for your job—please indicate which applications you find useful in performing your duties at work.** ***Check as many boxes as apply.***

Use		Encouraged By supervisor To use	Required By supervisor to use	Easy to use	Useful for performing job tasks
____	Microsoft Outlook	____	____	____	____
____	Microsoft Word	____	____	____	____
____	Microsoft Excel	____	____	____	____
____	Microsoft PowerPoint	____	____	____	____
____	Microsoft Access	____	____	____	____
____	Internet Explorer	____	____	____	____
____	Netscape Communicator	____	____	____	____
____	ADP	____	____	____	____
____	Visual Manufacturing	____	____	____	____
____	Visual Financials	____	____	____	____
____	The Raiser's Edge	____	____	____	____
____	Pathways (Vertex)	____	____	____	____
____	Fax Senior	____	____	____	____
____	Abra	____	____	____	____
____	Mail Manager 2010	____	____	____	____
____	ArcList	____	____	____	____
____	Prism	____	____	____	____
____	Choices 98	____	____	____	____
____	Star Searcher	____	____	____	____
____	Metafile	____	____	____	____
____	WinZip	____	____	____	____
____	Spectrum	____	____	____	____
____	JAWS	____	____	____	____
____	Other: _____	____	____	____	____

6. Telephone system questions

Y/N I use the new phone system.

Y/N I prefer the new phone system.

Y/N Given a choice, I would use the new phone system rather than the old phone system.
If **NO**, please check all the reasons that apply:
___ I don't know how to use it
___ The new system is difficult to use
___ I have not received sufficient training
___ I will have to take the time to learn to use the new system
___ Other: _____
If **YES**, please check all the reasons that apply:
___ The new system is easier to use
___ The new system saves me time
___ The new system is more reliable
___ Other: _____

I initialized my voicemail account at what point?
___ Immediately after training
___ One day after training
___ Two days after training
___ Three days after training
___ Four days after training
___ Five or more days after training
___ Haven't yet
___ I had someone else do it for me

7. Laptop questions

Y/N I have been given the chance to trade in my desktop computer for a laptop computer.

Y/N If given the choice, I would trade in my desktop computer for a laptop computer.
If **NO**, please check all the reasons that apply:
___ I don't need a portable computer
___ A laptop keyboard/mouse is difficult to use
___ I am used to my desktop
___ I will have to take the time to learn to use the new system
___ Other: _____
If **YES**, please check all the reasons that apply:
___ Laptops are portable
___ Laptops are newer technology
___ Laptops are faster
___ Laptops are easier to use
___ Other: _____

8. Demographic information

Race:

Gender: (please circle) male female

Age: (please circle) 20-29 30-39 40-49 50-59 60-69 70+

Position and department:

Years at company:

Years in current position:

Highest level of education achieved: (please circle) HS/GED AA BS/BA Masters PhD

Do you have a computer at your home? Y/N

Have you taken courses on computers through the company? Have these courses helped you?

Have you taken any courses on computers (not through the company)? If yes, have these courses helped you?

How would you rank your computer proficiency?
1=Very low 2=Moderately low 3=Below average 4=Average 5=Above Average
6=Moderately high 7=Very high

How much do you like using a computer?
1=Strongly dislike 2=Moderately dislike 3=Dislike 4=Indifferent 5=Like 6=Moderately like 7=Strongly like

I am typically one of the first in my group to start using a new application.
1=Strongly disagree 2=Disagree 3=Slightly disagree 4=Neither disagree nor agree
5=Slightly agree 6=Agree 7=Strongly agree

I am typically in the middle in my group to start using a new application.
1=Strongly disagree 2=Disagree 3=Slightly disagree 4=Neither disagree nor agree
5=Slightly agree 6=Agree 7=Strongly agree

I am typically one of the last in my group to start using a new application.
1=Strongly disagree 2=Disagree 3=Slightly disagree 4=Neither disagree nor agree
5=Slightly agree 6=Agree 7=Strongly agree

I receive adequate training for new applications.
1=Strongly disagree 2=Disagree 3=Slightly disagree 4=Neither disagree nor agree
5=Slightly agree 6=Agree 7=Strongly agree