

SOS

# Don't Hang Up: Organizational Diffusion of the Intelligent Telephone

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This paper analyzes an effort to introduce an "intelligent" or "enhanced" PBS telephone system at two separate office complexes within the same Fortune 500 firm. The effort to diffuse this communication technology officially succeeded at the one site and failed at the other site.

This paradox presented an opportunity to study both successful and unsuccessful implementation of a new communication technology within a single organization. It also provided an opportunity to test the adequacy of traditional diffusion theory for explaining the *rejection* of an innovation. In particular, diffusion theory does not emphasize political or symbolic forces in organizations, or the disjuncture between the organization and the end user as adopters.

Results from case study interviews and multivariate analyses suggest the following:

1. The attributes of the innovation did not discriminate between the success and failure building, or among the number of system functions used.
2. The number of enhanced telephone functions used (as a measure of level of adoption) is very slightly associated in the success building with increased phone traffic and usefulness, but is not associated in the failure building with any perceived impacts.
3. Technical factors interacted with political factors in preventing a successful adoption.
4. The relationships of attitudes and use of the telephone to perceive impacts and number of functions used differed by organizational role – management, technical staff, and administrative personnel.
5. Criteria for success and failure may differ at the organizational level and at the user level.

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"The rejection of technological innovations is a common occurrence about which we know relatively little. This is especially the case with computer-based information and communication systems that are often adopted by organizations, only to be rejected after considerable resources are devoted to implementation..." [22, p. 79].

If this is true, and it seems likely that it is, perhaps a useful way to go about understanding the diffusion of information systems is to sys-



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tematically study *failures* as well as *successes* in implementation. While most studies have focused on variables which influence success, there has been a recent emphasis on understanding failures (since the early statements by Ackoff [1] and Lucas [48]). This paper reports some of the findings from a study of the diffusion of the "intelligent telephone" in a large organization. The analysis considers perceived attributes and benefits of this innovation, and the political, technical, and implementation processes that influence success of failure of organizational information systems.

### 1. Prior Research on Understanding the Adoption and Implementation of Computer-Based Information Systems

The literature regarding the adoption and implementation of computer-based information systems is voluminous and beyond reviewing here. However, the literature in general does emphasize several sets of variables or processes which influence the outcomes of implementation efforts.

#### 1.1. Variables Influencing the Level of Adoption of an Innovation

Although there are several process models of diffusion and implementation [42,45,71,72,81,84], a five-stage model of organizational adoption is applied here [34,68]. The five stages include: agenda-setting, matching, redefining, structuring and interconnection.

As the particular agenda and innovation were already chosen by the organization discussed in the present research, we emphasize the matching stage. This situation underscores the fact that there are two levels of adoption that are involved in introducing new technology into a given social structure. First, it must be purchased, adopted, or in some way acquired, by the *organization*; second, it must be accepted by the ultimate *user community* (individual level). In the matching stage five subjective attributes of the innovation are evaluated to assess the fit of the innovation to the problems or needs established by the agenda: (1) its perceived relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. *Relative advantage* is the degree to which a new idea is perceived by the user as being superior

to the practice(s) it replaces; *compatibility*, the degree to which a new idea is perceived as being consistent with the potential adoptor's prior experience, beliefs and values; *complexity*, the degree to which an innovation is perceived by the user as being difficult to understand; *trialability* or *divisibility*, the degree to which a new idea can be given a small-scale trial by a potential adopter, or the extent [or degree] to which parts of the innovation may be tried; and finally, *observability* or *communicability*, the degree to which a new idea is visible to potential adopters.

Evidence about the innovation's attributes often come from observing others' use of the innovation, and by learning more about it through various communication channels including interpersonal (see [18]) or mass media (see [65]). "...A system is likely to succeed only if the people involved associate with it favorable - and realistic - meanings and expectations of the benefits" [46]. In short, innovations that are perceived as high in relative advantage, low in complexity, high in compatibility, communicability and divisibility have a more rapid rate of adoption [67,68].

This general model of the diffusion of innovations has fueled a tremendous body of literature. However, there are at least three limitations of the model. First, it assumes a simple, if not immediate, transferability of innovations from the developer to the user. A study based solely upon this model may be unable to explain why some innovations succeed and others fail [67,84].

Second, it basically takes a "systems rationalist" perspective, which assumes that consensus around rational criteria for adoption and evaluation of innovations is possible [41]. Some theorists, however, contend that, "...social scientists have traditionally (and erroneously) viewed innovation diffusion solely as an area of inquiry pertaining to individual choice (thus) focusing upon the individual or household adoption decision" [15, p. 50]. The bulk of past research emphasized the role of social networks, information flows, individual or household demographics and psychological variables such as innovativeness and resistance to adoption, but not organizational forces such as power, politics and symbolic use of innovation [19,37,41,51]. Thus, a "segmented institutionalist" perspective may be useful in identifying how potential adopters create their own meanings for a systems and negotiate or obstruct the implementation process.

Third, adoption and implementation studies have only recently considered the ongoing, evolving nature of an innovation and its implementation. This phenomenon has been called reinvention [35,67, 68]. Reinvention is the degree to which an innovation is changed by the adopter in the process of adoption. The concept of reinvention raises a crucial question: To what extent should the decision makers within the adopting organization press for fidelity (that is discourage the user of the innovation from altering the technology or its use from what the designer intended) or to encourage adaptation of the innovation (that is permit the user to modify the innovation according to his/her best judgement) [26,69,76]. Some argue that reinvention of any kind will dilute the innovation's effectiveness in some unpredictable way [56]; others argue that each organizational setting is different and that reinvention can be healthy [27,67].

While consensus for a "most effective" diffusion model is yet to be arrived at [4,10,75,76], in order for an office information system to be adopted by intended users a process of "mutual adaptation" must take place [49]. On the one hand, the work unit must understand and respond to the system's requirements. On the other hand, the information system (technology) must meet the needs and desires of the work unit and the organization. The key to this mutual adaptation is an interaction of three factors: management support, user participation, and training [50,80].

## 2. Factors Influencing the Success or Failure of Implementation Efforts

The implementation literature offers a wider range of perspectives. The primary sets of influences on implementation outcomes, other than technical aspects of the system itself, seem to be the following: organizational factors, change strategies, management support and users' attitudes [41].

Organizational factors include size, organizational slack, environmental conditions including competition, regulations, standards, the economy and the nature of the organization's business, life cycle, and organizational culture [3,30,47,61,78]. Less easily measured but influential aspects of an organization include the *organizational politics* and

*symbolic interpretation* of the innovation [5,22,28, 37,43,51,86], and a *climate for change* [29,32,37].

Frequently suggested change strategies include *phased implementation* and *adaptive planning* [2,29,32,34,38,40,74]; *training* [9,11,37]; and *user/involvement* [2,16,23,40,43,51,53,55,59,77].

*Top management support* has been shown to be critical influence in implementation outcomes [37,38,43,47,51,52,58,59;60,Ch. 8]; and includes the consideration of the behavior and decisions of *key actors* such as gatekeepers, opinion leaders, change agent(s), and the intended user community [47,79], as well as management, technical personnel and administrative staff [8,9,20,28].

Of course, the potential users are now recognized as a major influence on implementation efforts. Aspects of concern include the role *perceived needs* play (technology pull vs. technology push) in the successful adoption of new technologies [1,32,68]; *potential users' attitudes* toward the systems [17,19,8,31,37,41,60,61]; *users' allegiance* to some entity other than the organization [43,70]; and information workers' *stress* [37,70,86].

This very brief review of the literature on the process of adopting and implementing information systems leads to two research questions stemming from an analysis of one company's attempt to implement an intelligent telephone system: (1) Why can the same information technology "succeed" in one organizational setting and "fail" in another? and (2) What, in fact, constitutes "success" or "failure"?

The analyses focus on important variables identified above: political and cultural attributes of the innovation, characteristics of the organization, the role of key actors, change strategies, users' attitudes, and symbolic interpretation of "success" and "failure".

## 3. Data: The Case

### 3.1. Technology

A high-technology Fortune 500 firm recently installed an enhanced telephone switching system – commonly known as the "intelligent" telephone – at two of its office complexes located on the West Coast, near Los Angeles. Both complexes employed about 700 employees and were similarly

organized and staffed. These two sites are the first of many units within the company which will eventually use an intelligent system. The firm's

Table 1  
Primary Functions of an Enhanced Telephone System

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*Station-user features*

1. Add-on features
2. Automatic off-hook camp-on
3. Callback (camp-on)
4. Call forwarding (with cancellation or change from forwarded or original station)
5. Call hold (off-hook and on-hook conditions)
6. Call park
7. Call pick-up-ringing line (group or directed)
8. Call transfer
9. Call waiting indication
10. COM lines (executive intercom)
11. Distinctive ringing
12. Do not disturb
13. DOD (direct outward dialing)
14. Executive busy override
15. Off-hook routing override
16. Private call
17. Save/repeat number dialed (local memory)
18. Speed calling (up to 999 numbers in system-memory and 250 in station memory)

*System Features*

1. ACD (automatic call distribution)
  - a. traffic statistics
  - b. call waiting visuals
  - c. recorded source identification
  - d. delay before announce
  - e. multi-level overflow
  - f. agent monitoring
  - g. autoprnt for statistics
  - h. "follow-me" agent statistics
2. AND (automatic network dialing)
3. Call detail recording - outward and/or inward
4. Call detail recording - via floppy disc or 9-track mag tape
5. Call queing (call-back and standby)
6. CAS (centralized attendant service)
7. CBXI management reporter (on-site collation and retrieval of calling formation reports)
8. Data communications
9. Digit translation
10. DTMF-to-rotary conversion
11. Electronic message
12. Electronic phones (ETS-100-200 and -300)
13. Expanded traffic measurement capability
14. Floppy disk automatic program
15. Forced authorization codes
16. Message registration
17. Route optimization (with unique MCI and SP dial-up access)
18. Satellite operation
19. Serial data interface
20. Toll restriction

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implementation strategy is consciously incremental. This will allow results from the early adoption efforts to be used to guide later implementation efforts. The particular intelligent switch installed in this situation provides up to 200 different functions, which is standard for most current on-site telephone switches. Some of the functions appear in Table 1.

From an engineering viewpoint, of course, the intelligent or enhanced telephone switching system is radically different from the telephone service generally available from the local operating company. Besides the capabilities noted above, the intelligent system is capable of transmitting both voice and data simultaneously over a single pair of standard telephone wires by converting analog voice signals to digital signals [82]. The enhanced switching system can also serve as a digital interface between a desktop terminal (e.g., personal computer or word processor) and a mainframe computer (e.g., minicomputer). As a result, data can be transported among computers via existing phone wire in order to access individual, corporate and outside databases, as well as communicating via electronic mail.

For individual users, the capabilities include such functions as call-forwarding, call-holding, automatic redial, conference calling, and a "do not disturb" feature.

In addition to the user-oriented functions of the enhanced switching system, the on-site switching has features designed for the system's manager. The station message detail reporting feature keeps a record of each and every call. For example, "outward toll dial" tracks and records outgoing long distance calls for each station, and "automatic billing" not only keeps a usage record, but automatically invoices the appropriate division or department within the organization for calls made from their authorized telephones. And while the company has not yet done so, if management wishes more thorough records (which allows detailed reports to be prepared as needed) or, on the other hand, if management becomes concerned with information overload (too many records), additional software can be purchased that allows telephone activity records to be stored electronically. In short, the enhanced switching system literally turns the telephone into a hand terminal linked to a mainframe computer.

### 3.2. Success and Failure

Within a short period of time, the employees in one of the two buildings were strongly objecting to the new telephone system while no such mass rejection was experienced at the second building. "Failure" was easy to define and measure: The new telephone system was in fact physically removed from the one building. The initial inclination might, of course, be to label the one installation a "failure" and the other a "success." On the other hand, it was not clear at the beginning of the research whether or not the users in the "success" building were actually utilizing the modern technology as anything other than a traditional telephone system, which the new technology was intended to replace.

Our primary research question, then, is to determine which variables associated with the diffusion/implementation process influenced the different outcomes? The secondary question is to more clearly understand what constitutes success and failure?

## 4. Method

### 4.1. Sample

The sample for this study consisted of employees who had been introduced to the intelligent telephone when it was originally installed for use in the west coast facilities of this Fortune 500 firm. Initially, 50 names were randomly selected from each building. Some of these individuals were no longer located in the building where they first used the enhanced phone system. However, they were still requested to participate in the study and were asked to base their input on their best recollection of their initial experience. Forty-two people participated from the facility where the innovation had been rejected, and 40 employees participated from the facility where the system had not been rejected, representing an 82% response rate.

Users were naturally stratified insofar as each building comprised the same basic job mix, operated within the same corporate structure and philosophy, had received the same training, used exactly the same technology, and worked in buildings which were, in fact, fairly close to one another.

Thus, some typical sources of variation have been controlled in this field study.

### 4.2. Questionnaire and Interviews

Respondents were asked to complete a questionnaire and return it to the Communications Department (via inter-departmental mail) within 48 hours of receipt. A cover letter informed them that the study was part of an effort to analyze the intelligent telephone in order to determine whether or not it was a useful instrument for the majority of the employees at this firm. This message was personally reinforced by the respondents' immediate supervisor. All respondents were assured of the complete confidentiality of their responses.

Open-ended interviews were also conducted with six managers involved in the decision to implement the intelligent telephone and one other individual. These seven people included the individual who conducts a major portion of the user training on the new intelligent telephone system; a Senior Communications Analyst who had been watching over this project from its inception and is committed to its ultimate success; a Senior Communications Analyst who came to the corporation from one of the telephone companies and approaches the introduction of telephone technology from a more technical viewpoint; a Manager of Research; the Manager of Communications; the Operations Supervisor, who was the highest person in the management hierarchy we interviewed and who is extremely knowledgeable about the history and growth pattern of the telephone in society; and one additional person who was chosen because she was not involved with the adoption process, yet had undergone training in using the intelligent telephone.

## 5. Results

### 5.1. Usage

Respondents were asked to recall the number of functions used at two separate points in time. \*

\* That there is bias and estimation problems in measures of system usage based on recall is undeniable. Its role in information systems studies is summarized in [60, p. 208]. Ideally, computer-monitored usage statistics should be used [63]. However, such records were not available to the authors.

Table 2  
Comparison by building of number of enhanced functions used by number of respondents at two points in time.

Time Period	Building	Number of functions used										Total	Mean **
		0	1	2	3	4	5	6	7	8	9		
One:	Success	1	8	5	10	4	7	1	2	1	1	39	3.49
	Failure	7	6	9	12	3	3	0	1	1	0	35	2.91
Two:	Success	14	5	4	6	1	5	1	1	1	2	40	2.48
	Failure *	30	2	4	1	0	3	2	0	0	0	42	0.95

\* Some respondents in the failure building had been transferred to buildings which had an intelligent telephone switch.

\*\*See text for t-test comparisons.

The times were: (1) time one: immediately after being trained in the use of the new telephone system; and (2) time two: about a year later. Usage results indicate that those users in the building that subsequently rejected the innovation used only slightly, but not significantly, fewer functions than did users in the other building (means = 3.5, 2.9;  $t = 1.63$ ;  $p < 0.15$ ). While there is a statistically significant difference in usage levels between the two buildings at time two, this is not very interesting because the switch had been removed from the one office complex. What might be of interest, however, is that the usage of functions in the building where the intelligent telephone system was not rejected dropped off significantly between time one and time two: from less than 3% of the user community not using any of the enhanced features to about 35%; and from 65% using between 3 and 9 functions, to less than 43% using that number of enhanced features. The mean number of features used dropped from 3.5 to 2.7. This within-group t-test is significant, at  $p < 0.0005$  ( $t = 3.52$ ;  $n = 39$ ). Similar results have been found in other studies, such as a decline in usage of computer based messaging and videotext systems after initial familiarization with the system [64,65].

Further, in either building only nine of the system's features available to individuals were ever used. Only two people used all of these nine functions. Table 2 shows this distribution.

The limited acceptance of this innovation is further realized when considering that of the total nine functions used in the enhanced phone system, only three are unique to the *intelligent* telephone. These are the "save and repeat" feature, "speed dialing" and the "do not disturb" features. The remaining six functions used are offered by most standard business telephone systems: call-

back, call forwarding, callhold, call transfer, call waiting and COM lines (executive intercom).

In other words, the new system, even today, is largely being used as a traditional telephone system. As a result, the company's *employees* are not enjoying the full capabilities that are possible in state-of-the-art, computer-mediated telephone systems. However, the administrative system features (e.g., billing and monitoring functions) may well be providing important benefits to the organization.

### 5.2. Innovation Attributes and Impacts

In an attempt to understand the attributes which contribute to the acceptance or rejection of the intelligent telephone, several questions asked respondents to rate the system on specific measures of relative advantage, complexity, compatibility, communicability, status, reliability, innovativeness, productivity and impacts. The impact measures were variables used in a previous study of an electronic mail system [64], which in turn were developed to replicate earlier studies (as reviewed in [61]). Surprisingly, there were no significant differences in mean values of these variables between the success and failure buildings. Users' attitudes toward computers in general were also assessed. No significant differences were found here, either. However, users in the failure building did tend to perceive computers as "enabling one to handle much more work" more than did users in the success building ( $p < 0.09$ ).

As there were no significant differences between the buildings in users' perceptions of the attributes of the innovation, those attributes cannot be held accountable for the difference in outcomes. Therefore, in order to describe underlying factors of attributes and impacts in an attempt to

Table 3  
(a). Factor analysis of attitudes towards enhanced telephone system.

Variables *	Factors				
	Appropriateness	Complexity	Functionality	Good System	Status Status
<i>Status:</i>					
Having	-0.11387	-0.04992	<u>0.79491</u>	-0.2410	0.29745
Knowing how to use	-0.06254	-0.08746	0.09005	0.23007	<u>0.79820</u>
<i>Difficult/easy:</i>					
System features	-0.11431	<u>0.85394</u>	0.13960	0.05279	-0.00440
Remembering codes	0.02876	<u>0.72619</u>	-0.03021	0.30168	-0.13711
Help from monitors	0.13873	<u>0.69740</u>	-0.10236	-0.00721	0.16377
Help from co-workers	0.09217	<u>0.51615</u>	-0.04068	-0.06321	0.64052
Reliability	0.09581	<u>0.02649</u>	-0.00322	<u>0.77803</u>	0.24453
Innovative system	-0.01949	0.11091	0.05228	<u>0.79771</u>	-0.00700
<i>Appropriateness for:</i>					
Exchanging info.	0.29036	0.32897	0.48333	0.56503	-0.06889
Bargaining/negotiating	<u>0.71287</u>	0.09608	0.16368	-0.03373	0.06492
Getting to know people	<u>0.67366</u>	0.10046	-0.12522	0.15522	-0.17640
Asking questions	0.38153	0.14600	<u>0.73087</u>	0.31935	-0.12568
Staying in touch	0.45463	-0.17978	<u>0.70987</u>	0.25432	-0.08192
Generating ideas	<u>0.79065</u>	0.05985	0.13268	0.07326	0.03109
Solving disagreements	<u>0.78752</u>	-0.15148	0.16252	-0.00950	0.05008
Eigenvalues	3.81	2.36	1.57	1.38	1.14
% Varianced explained	25.40	15.73	10.46	9.22	7.61
Alpha reliability **	0.76	0.69	0.68	0.66	-
Mean of scale	1.39	3.00		3.00	1.96
S.D. of scale	0.38	0.75		0.92	1.02
Non-missing N of scale	69	67		79	82

(b). Factor analysis of impacts of enhanced telephone system.

Variables *	Factors		
	Task Benefits	Usefulness	Traffic
<i>Decrease/Increase in:</i>			
Phone usage	0.50427	0.07882	0.55844
Calls received	0.35155	0.05320	<u>0.67471</u>
Quantity of Work	<u>0.79387</u>	-0.14944	0.12197
Quality of work	<u>0.65404</u>	0.48689	0.20786
Rate of handling info.	0.21479	<u>0.77524</u>	0.31791
Contacts you initiate	<u>0.67776</u>	0.39178	0.32962
Contacts others initiate with you	<u>0.54719</u>	0.34312	0.43838
Communications from superiors	<u>0.75016</u>	0.29679	0.18203
Communications to superiors	<u>0.82305</u>	0.30263	0.22549
Communications with other divisions	<u>0.74091</u>	0.24117	0.30368
Number of times leave desk	0.28830	<u>0.53010</u>	-0.44424
Amount of after-hours work	<u>0.72616</u>	0.28410	-0.00862
New system helps avoid busy signals	0.09793	0.20894	<u>0.77705</u>
Difficult/easy to do without new phone	0.13136	<u>0.77723</u>	0.10412
Eigenvalues	6.72	1.41	1.14
% Variance explained	47.99	10.06	8.16
Alpha reliability **	0.92	0.63	0.68
Mean of scale	3.12	2.70	3.10
S.D. of scale	0.44	0.56	0.54
Non-missing N of scale	77	76	77

\* All items five-point scale except Status: Having (1 = yes, 2 = not sure, 3 = no) and Appropriateness items (1 = appropriate, 2 = not). "5" indicated "very easy," "significantly increased" or similar scale anchor on all other items.

\*\* Scales representing factors were constructed by taking the average of variables loading at least 0.6 on one factor and no more than 0.4 on any other factor. The scale value was set to missing if more than 15% of the constituent variables had missing values. Several exceptions were intended to keep conceptually similar variables together. For example, although "exchanging info," "asking questions" and "staying in touch" loaded on a separate factor, they were added in the "Appropriateness" scale. The alpha for the four-item scale was 0.76; adding the three other appropriateness items raised the alpha to 0.83. Scale items are

Table 4  
Regression of number of functions used on attitudes toward, or impacts of, enhanced telephone in success and failure buildings.

		Building:		Failure
<i>Independent Variables:</i>				
<i>Attitudes</i>	<i>Beta</i>	<i>p</i>	<i>Model</i>	
Good System	0.39	0.17	df = 4,19	
Complexity	-0.11	0.65	F = 0.77	
Appropriateness	0.00	0.99	p < 0.56	
Status	0.16	0.48	R <sup>2</sup> = 0.14	
				Adj. R <sup>2</sup> = 0.00
		Building:		Success
<i>Independent Variables:</i>				
<i>Attitudes</i>	<i>Beta</i>	<i>p</i>	<i>Model</i>	
Good system	0.10	0.66	df = 4,24	
Complexity	-0.01	0.95	F = 0.61	
Appropriateness	0.20	0.31	p < 0.66	
Status	0.18	0.40	R <sup>2</sup> = 0.09	
				Adj. R <sup>2</sup> = -0.06
		Building:		Failure
<i>Independent Variables:</i>				
<i>Impacts</i>	<i>Beta</i>	<i>p</i>	<i>Model</i>	
Traffic	0.19	0.41	df = 3,28	
Usefulness	0.37	0.14	F = 2.55	
Task Benefits	-0.07	0.78	p < 0.08	
				R <sup>2</sup> = 0.21
				Adj. R <sup>2</sup> = 0.13
		Building:		Success
<i>Independent Variables:</i>				
<i>Impacts</i>	<i>Beta</i>	<i>p</i>	<i>Model</i>	
Traffic	0.67	0.002	df = 3,33	
Usefulness	0.44	0.01	F = 5.00	
Task Benefits	0.59	0.01	p < 0.006	
				R <sup>2</sup> = 0.31
				Adj. R <sup>2</sup> = 0.25

NOTE: independent variables are scale items identified in Table Three.

provide a smaller set of variables to use in predicting usage of the intelligent telephone, the attribute variables and the impact variables were each subjected to varimax rotated factor analysis. The findings, along with brief descriptions of the items, appear in Table 3. Perceived attributes of the intelligent telephone and the organizational context produced five factors explaining 68.4% of the variance. They were labelled: (1) appropriateness, (2) complexity, (3) functionality, (4) good system, and (5) status. Perceived impacts of the new technology produced three factors explaining 66.2% of the variance. They were labelled: (1) task benefits, (2) usefulness, and (3) traffic.

The number of enhanced telephone functions used were then regressed on attitudes and on impacts, for each building. The *number of functions used* was chosen as an indicator of "level of adoption" of the enhanced telephone system by intended users because it is these features that sets this particular technology apart from the traditional telephone. It seems reasonable to conclude, therefore, that the greater the number of functions one uses from the available features of the new system, the more one has adopted the new technology. These findings are reported in Table 4. No significant variance is explained by the *attitude* variables. These tables reinforce the evidence that, in this particular case, attitudes towards the innovation played no role in determining how much a user adopted the new technology in his/her daily routine, and this lack of relationship held in both buildings. The *impact* variables, played a significantly greater role, but only in the success building. Task benefits, traffic and usefulness all are significant predictors of the numbers of intelligent telephone functions used. That is, the system is perceived to be able to facilitate increased, wait-free calling, a higher rate of handling information, more calls received, and increased work benefits. Moreover, users in the success building associate these benefits with usage of more system features. However, note that the items on the usefulness scale are increased information rate, increased number of times leaving desk, and increased ease of doing *without* the telephone. Attitudes and benefits were not significantly related to system usage in the failure building.

Thus, there is some evidence that the innovation was successfully adopted in the first building: people used more features of the system, and this use was associated with greater facility in handling more conversations and work-related benefits. However, there is an indication that the actual use of the system was unsatisfactory - people who used the system more were more likely to feel they could do without it.

### 5.3. Alternative Explanations for Non-Adoption

The difference between adoption success and failure, and indeed between levels of usage, cannot be explained on the basis of traditional innovation attributes, and only partially on the basis of perceived benefits. That is, characteristics of the in-

novation, abstracted from the organizational context and users' needs, are, in this case, insufficient to understand the diffusion process. \*\* Therefore, aspects of the implementation effort and the technical system must be considered. Some of the likely reasons for failure can be drawn from responses to open-ended questions of the survey. These refer to aspects of training, technology, organizational politics, and organizational roles of users. Some of the comments follow:

*Training Aspects.* It became obvious that training was insufficient. Even though formal floor monitors were established to provide reference sources, users were not aware of their existence. The following quotes indicate these gaps in training:

"... too many options... procedures are too complex."

"The problem is, if you don't need or use the features it's difficult to remember how."

"Dialing is a pain!"

"I wasn't trained (properly) on the system."

"Secretaries did not receive the proper training."

"If a secretary is not around, other people are much less likely to answer somebody else's phone and take a message."

"Floor Monitors? There's no such thing."

"What's a floor monitor?"

*Technical Aspects.* Virtually everyone in the failure building reported experiencing mass frustration with technically related problems in trying to get the enhanced telephone system to work properly. They seemed to like the idea behind the new telephone system, but simply could not get it to work adequately. Technology personnel acknowledged that somehow the proper air conditioning unit was not installed inside the control room where the telephone switching system (mainframe computer) was housed. This was an acute problem, and one that was not encountered in the other building. By the time these problems were resolved in the failure building, user's attitudes toward the reliability of the system in the failure building were so low that the change agents simply could not rekindle much enthusiasm.

The users' description of the technical problems can perhaps be best understood by placing them into three categories:

\*\* Thirty-two items pertaining to organizational culture were also asked. Only two of those were significantly associated with usage of features.

(1) The design of the technology itself.

"Calls took noticeably longer to connect or start ringing."

"Long distance dialing protocol was too cumbersome. Many people blew it 50 percent of the time."

"Procedures requiring you to depress buttons on the handset cradle were confusing; wait a second, then push down a second time. If you push a little too long, it hangs up; if you push too little, it doesn't work."

"The strange clicks are confusing when transferring a call."

"... one of the most frequently re-occurring problems is the inability to pick up calls from a secretary's console for extensions within the pickup group."

(2) Problems in system functioning due to inadequate air conditioning.

"The lines are consistently 'noisier' than anywhere else."

"... the phones often 'call back' for no apparent reason, bumping workers off computer terminals and interrupting work."

"People calling in would complain about the line being busy when it wasn't. My phone had never even rung."

"At times it will not allow me to pick-up calls, callers cannot always hear me answer and (therefore) have to call back, and not always can I reconnect to the caller."

(3) Planning or system management oversights.

"I have only two incoming lines. Therefore, if someone wishes to hold on the line while I take another call, both of my lines are tied up."

"... often (weekly) the system was 'rebooted' and all individual programming was lost."

"We had twelve people (in our project group), but only ten could be one a comm-line."

"The days I spent on overtime during the weekend I could not call out, as the computer did not work on Sundays. Great for emergencies, huh?"

"The conference function only worked on the managers' phones, as if the techs never needed to have two engineers on (the phone) at the same time."

*Political Aspects.* This particular company is currently undergoing a major growth period in

which a large number of employees is being transferred from the central regional offices to outlying facilities. Many of these facilities, while being very modern and in many ways even a more desirable environment in which to work are located some distance from the hub of the central regional complex. Not unexpectedly, this oftentimes is met with resistance by those who are concerned about being taken out of the decision-making limelight. The personnel interviews indicated that the employees in both buildings were equally disgruntled over being moved out of the limelight.

However, the major technical problems in the failure building became a convenient excuse for the people in the one complex to complain loudly about the support facilities in the new building. There apparently was an onslaught of formal requests from employees in this complex to be transferred back to regional headquarters. There was at least one case where the employee was actually transferred back to his old office.

The political explanation is further supported by noting that there was no significant difference between either the success or the failure buildings on the question: "How reliable does the enhanced telephone system seem to you?" Yet, as noted above, the change agents reported a far greater number of *complaints* regarding technical problems from the *failure building* where the intelligent telephone was ultimately rejected. That is, the apparent *cause* (system unreliability) of the complaints was equal in the two buildings, but the outcome *behavior* (complaints) was noticeably different. Thus, there were *other* causes, such as political discontent, that took advantage of the real problem with reliability and training.

*Organizational Role Aspects.* The change agents did anticipate some differences in the acceptance level among the three levels of employees using the new technology (management, technical and administrative). For example, many of the firm's management and technical personnel are also scientists who operate in what some there call an "Einstein environment" (a think tank). These individuals apparently often see the telephone as a necessary evil that interrupts their "think time"; thus no automated system would be seen as an improvement. Our interviewees felt that indeed managers *were* unwilling to use the phone, and the questionnaire data do show lower levels of usage for managers and technical personnel than

Table 5

Regression of number of functions used on time spent using the telephone and perceived appropriateness of the new telephone system at time one by job category (management, technical staff, and administrative personnel).

Management Personnel			
Independent Variables:	Beta	p	Model
			df = 2,9
Time using telephone	-0.44	0.21	F = 1.38
Appropriateness	0.48	0.18	p < 0.30
			R <sup>2</sup> = 0.23
			Adj. R <sup>2</sup> = 0.06
Technical Staff			
Independent Variables:	Beta	p	Model
			df = 2,29
Time using telephone	0.58	0.001	F = 8.51
Appropriateness	0.37	0.02	p < 0.001
			R <sup>2</sup> = 0.37
			Adj. R <sup>2</sup> = 0.33
Administrative Personnel			
Independent Variables:	Beta	p	Model
			df = 2,16
Time using telephone	0.55	0.02	F = 3.38
Appropriateness	0.08	0.72	p < 0.06
			R <sup>2</sup> = 0.30
			Adj. R <sup>2</sup> = 0.21

Table 6

Regression of perceived task benefits of intelligent telephone on time spent using the new telephone on time spent using the new telephone system and perceived appropriateness of new telephone system at time one by job category (management, technical staff, and administrative personnel).

Management Personnel			
Independent Variables:	Beta	p	Model
			df = 2,8
Time using telephone	0.08	0.82	F = 1.67
Appropriateness	0.30	0.17	p < 0.25
			R <sup>2</sup> = 0.29
			Adj. R <sup>2</sup> = 0.12
Technical Staff			
Independent Variables:	Beta	p	Model
			df = 2,30
Time using telephone	0.52	0.005	F = 4.86
Appropriateness	0.08	0.93	p < 0.01
			R <sup>2</sup> = 0.24
			Adj. R <sup>2</sup> = 0.19
Administrative Personnel			
Independent Variables:	Beta	p	Model
			df = 2,20
Time using telephone	0.11	0.62	F = 0.90
Appropriateness	0.28	0.22	p < 0.44
			R <sup>2</sup> = 0.08
			Adj. R <sup>2</sup> = 0.00

for administrative personnel (14% and 11% as compared to 28% of an average working day,  $p < 0.05$ ), although all reported similar numbers of functions used.

There is also evidence of differential influences on adoption between different job categories (management, technical and administrative).

The reported number of intelligent telephone functions used was not associated with time spent using the telephone in one's daily work routine or with perceptions of appropriateness of the new systems for managers, but was associated with time spent using the phone for technical and administrative personnel, and appropriateness for administrative personnel. Table 5 shows these results.

The perceived task benefits of using the intelligent telephone were also not associated with telephone use and appropriateness for managers or for administrative personnel. For technical staff, their time spent using the phone, but not their perceptions of appropriateness, was related to reported benefits of the new system. Table 6 shows these results.

Managers' reported innovation behaviors or evaluations were not related, then, to specific phone uses or perception of the appropriateness of the system. Perhaps this is due to the managerial practice of having secretaries screen and place calls. Perhaps the functions of such a system and the kinds of benefits measured are not as germane to managerial work as they are to other workers. For administrators, only time spent using the phone played a role. But the use of the phone for work-related tasks, and appropriateness of the news system, did influence the use and benefits reported by technical staff. That is, the relative advantage of an innovation (functions and task benefits) may be more salient to those who have more specific needs for the innovation. The implication is that managers may be less appropriate, and less motivated, users of such an organizational technology! Alternatively, technical staff are more particular or evaluative in nature concerning information systems, so their needs and perceptions are more likely to influence their adoption behavior.

#### 5.4. Success or Failure

The preceding analyses have shown that in spite of very similar perceptions of the attributes

of the intelligent telephone, similar attitudes toward computers, and similar perceptions of the benefits derived from the innovation, two similar user groups produced quite different outcomes in the intraorganizational diffusion process. Political dissatisfaction from being moved out of the central action led users in the failure building to take advantage of real technical problems in that building and training oversights in both buildings as an opportunity to reject an innovation introduced by the organization. The analysis indicates that traditional diffusion theory is, indeed, not always sufficient to explain the adoption or rejection of innovation. Other more contextual perspectives are required to understand such processes.

However, even the analysis of the causes of rejection does not consider the full implementation process. What happened *after* the system was "successfully" adopted? Note that the success building did not maintain its initial usage of features. In fact, upon further interviewing, respondents provided information that indicated that the continued adoption by the *organization* was a product of different interpretations of what constituted success, and may not be strongly linked to how users respond to the innovation over time.

For example, due to the potential benefits to the *organization* through better accounting procedures and cost-reducing features at the systems level, management may well define success as anything short of rejection of the new system. However, the user community, not surprisingly, appears to define success negatively as nothing more than letting them carry on business as usual, without creating any undue inconvenience to them in their daily routine. This new intelligent telephone system is not being used much differently than was the prior telephone system, at least by individual users. Further, increased use and processing capabilities of the system were not associated with increased dependence on the phone system in users' minds. The case and survey data therefore indicate that this particular implementation was not successful with respect to *individuals'* adoption, even in the "success" building.

#### 6. Summary

Analysis of users' perceived attributes of an intelligent telephone system, users' attitudes to-

wards the innovation, and perceived impacts of the system was based upon a small random sample from two offices in a large firm. The results indicate slightly favorable responses toward the innovation and its impacts, but could not identify perceived attributes of the innovation that differentiated between a "successful" and a "failed" adoption of the innovation. Further, levels of individual usage of the enhanced telephone's functions could not be distinguished by attitudes, and only slightly by the perceived increases in information handling and phone calls. Even so, however, users did not feel that it would be difficult to do without the intelligent telephone. Greater explanation for failure comes from an understanding of the politics of organizational decision-making, technical difficulties with the system, professional norms, lack of training, insufficient perception of top management support, and absence of user involvement. Users' attitudes about these aspects of implementation seem to provide the best explanation for the clear rejection of the system in one building. Additionally, even the criterion of "success" is contextual, and may be defined differently by the organizational adopters and by end-user adopters.

These results imply several insights into the process of diffusing and implementing organizational information systems. First, while it is obvious that technical aspects of a new system must be reliable and somewhat transparent to users, these aspects can easily be used as symbolic and political rationales for resisting innovation. This is because while the innovation *itself* may be useful, the accompanying *organizational change* may be threatening or unacceptable to particular stakeholders. Thus, planning and evaluation of new media systems should assess both the climate for change and the range of potential stakeholders in the change [62].

Second, individual and organizational needs play a role in assessments of innovation benefits. The fact that respondents can report increased usage and increased communication activity while reporting that it would not be difficult to do *without* the innovation, indicates that being able to do more of the same faster is not necessarily a boon. In this case, the fundamental benefits of the innovation as implemented seem to accrue to organizational record-keeping, not to individual users. Linking the telephone to the organization's billing routines on the mainframe is a valid and

innovative use of technology; it cannot be assumed to be sufficient justification for users attempting to accomplish their day-to-day tasks. For the technology analysed here, there seem to be few components explicitly attractive and useful to potential adopters. Therefore, organizational adoption and individual adoption need to be managed and assessed differently.

Third, qualitative and quantitative analyses are complementary approaches toward understanding implementation outcomes. Ideally these analyses would also include the use of computer-monitored data which could indicate actual behavior – actual use of the system – rather than reported use.

Finally, the implementation and the subsequent diffusion of organizational information systems must be seen, theoretically, as a contingent process. A wide variety of variables has been shown to influence success or failure. Researchers and practitioners must manage this complexity by means of pilot studies and systems, planning, ongoing evaluation and feedback. The present result of "no relationship" – except for predictors of adoption in the success building, and for technical staff – involving traditional innovation variables cannot be seen as indicating their lack of importance to the diffusion process. Rather, this finding must be seen as one *possibility* when far stronger forces – political and task-oriented needs – come into play. Traditional diffusion theory must be augmented by implementation research which focusses on the political and subjective forces that come into play after an organization has decided to adopt an information system.

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