

## Extending the Technology Acceptance Model to Account for Social Influence: Theoretical Bases and Empirical Validation

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### Abstract

The Technology Acceptance Model (TAM) represents an important theoretical contribution toward understanding IS usage and IS acceptance behaviors [6, 19]. However, as noted by several IS researchers [cf: 4, 5, 6, 9, 14], TAM is incomplete in one important respect: it doesn't account for social influence in the adoption and utilization of new information systems. Davis [4] and Davis et al. [6] noted that it is important to account for subjective norm (SN), the construct denoting social influence. However, they observed that the conceptualization of SN based on TRA (Theory of Reasoned Action) has theoretical and psychometric problems. Specifically, they observed that it is difficult to distinguish if usage behavior is caused by the influence of referents on one's intent or by one's own attitude. They suggested that this problem may be circumvented by using an alternative theoretical basis for conceptualizing SN, specifically in terms of Kelman's [10, 11] processes of social influence (compliance, identification and internalization). Within the context of organizational enterprisewide implementation and adoption of collaboration and communication technologies, this study establishes theoretical and empirical bases for the above conceptualization originally suggested by Davis and his colleagues. The construct of social influence is operationalized in terms of Kelman's processes of internalization, identification and compliance. Analyses of field study data provide evidence of the reliability and validity of the proposed constructs, factor structures and measures. The findings enable future researchers to account for social influence in further investigating TAM.

### 1. Introduction

The Technology Acceptance Model (TAM) was developed by Davis [4] to explain computer-usage behavior. The theoretical basis of the model was Fishbein and Ajzen's [7] Theory of Reasoned Action (TRA). The goal of TAM is "to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations,

while at the same time being both parsimonious and theoretically justified" [6, p. 985].

TRA is a widely-studied model from social psychology which is concerned with the determinants of consciously intended behaviors [1, 7]. According to TRA, a person's performance of a specified behavior is determined by his or her behavioral intention (BI) to perform the behavior, and BI is jointly determined by the person's attitude (A) and subjective norm (SN) concerning the behavior in question.

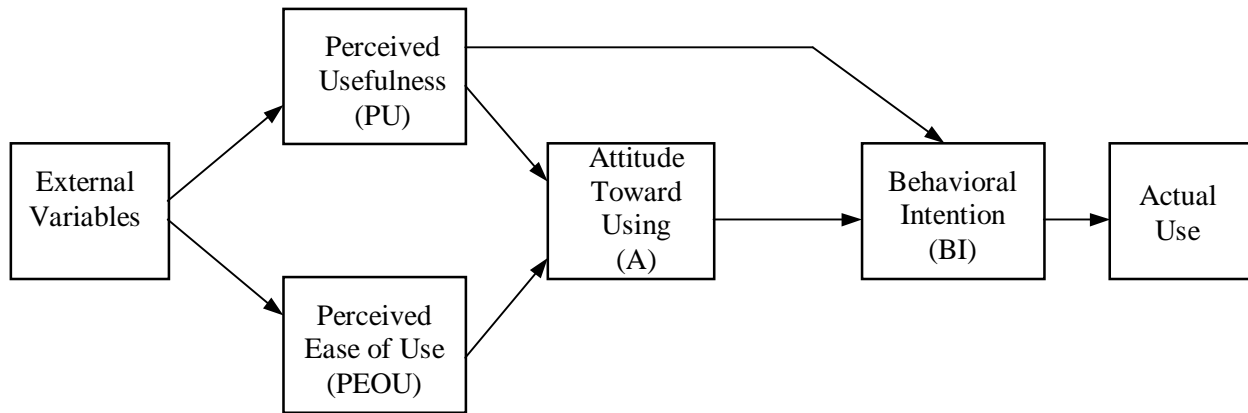
TAM uses TRA as a theoretical basis for specifying causal linkages between two key sets of constructs: (1) Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), and (2) user's attitude (A), behavioral intentions (BI) and actual computer usage behavior. PU is defined as the user's "subjective probability that using a specific application system will increase his or her job performance within an organizational context" [6, p. 985]. PEOU refers to "the degree to which the user expects the target system to be free of effort" (p. 985). Both PU and PEOU predict attitude toward using the system, defined as the user's desirability of his or her using the system. A and PU influence the individual's BI to use the system. Actual use of the system is predicted by BI. Please see Figure 1 (a) and Figure 1 (b) for the two models.

A review of scholarly research on IS acceptance and usage suggests that TAM has emerged as one of the most influential models in this stream of research [5, 6]. The TAM represents an important theoretical contribution toward understanding IS usage and IS acceptance behaviors [6, 19]. However, this model -- with its original emphasis on the design of system characteristics -- does not account for social influence in the adoption and utilization of new information systems [5, 6].

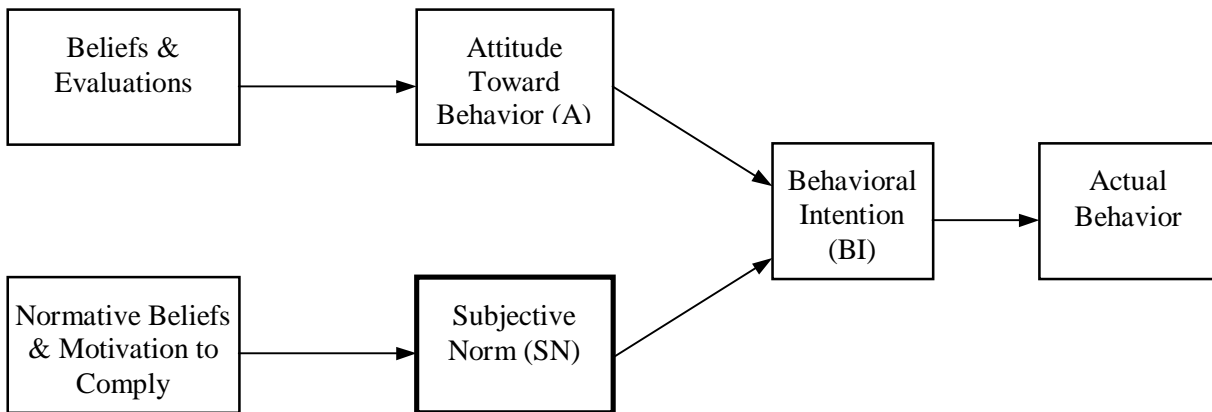
### 2. Motivation for the Study

Davis [4] and Davis et al. [6] had observed that the omission of subjective norm from TAM represented an important area needing further research. They had noted that the theoretical basis of TRA makes it difficult to distinguish if usage behavior is caused by the influence of referents on one's intent or by one's own attitude.

**Figure 1 (a). Technology Acceptance Model (TAM)  
(Based on Davis et al. 1989)**



**Figure 1 (b). Theory of Reasoned Action (TRA)  
(Based on Fishbein & Ajzen 1975).**



For instance, Davis [4] observed that: “the subject may want to do what Referent X thinks he/she should do, not because of X’s influence, but because the act is consistent with the subject’s own [attitude].” Davis et al. [6] underscored that the role of social influences in information technology acceptance and usage represented an important area for better understanding of ‘real world’ applications of TAM.

More recently, this issue seems particularly relevant to successful implementation of collaborative systems such as electronic commerce applications, where effective utilization is often dependent upon social influences of various kinds.

Not only did Davis [4] and Davis et al. [6] highlight the importance of developing knowledge in this area, they also suggested a theoretical base that could possibly help in the process.

Specifically, they observed that Kelman’s [10, 11] theoretical distinction between the processes by which social influences affect behavior, discussed in section 3, may provide one such basis for operationalizing the subjective norms. This study attempts to develop the recommended line of inquiry for understanding the role of social influences as they relate to individual acceptance and usage behavior in organizational implementation of new information technologies.

In this study, analyses of field study data provide evidence of the reliability and validity of the proposed constructs, factor structures and measures. The findings contribute to future research on accounting for social influence in TAM. Such future application areas could include collaborative systems in which technology acceptance and usage are affected by social influence processes. Research informing the role of social influence

processes in technology acceptance and usage behavior is also relevant for understanding the instability of belief structures (such as Perceived Ease of Use and Perceived Usefulness) in certain contexts of technology utilization.

These issues are important because usage behaviors caused by one's own attitude are more sustainable in the absence of external influences such as peer pressures. The issue of users' 'buy in' of the use of new information technologies such as specific electronic commerce applications is based on internalization of use behaviors that are embedded in users' attitudes. Such internalized behavior, for example, would motivate a person to almost always investigate new books on the Amazon.com web site rather than the campus book store. The socially-communicated perceptions and beliefs may influence usage behavior of such applications even when the procurement of books could be often less expensive and more efficient when done through a telephone call to the campus book store. In the adoption and diffusion of new technologies such as collaborative systems and e-commerce systems, it is timely to study how social influences shape users' attitudes.

### 3. Theoretical Bases for the Study

Kelman's [10] study of social influence was motivated by his interest in understanding the changes brought about in individuals' attitude by external inputs, such as information communicated to them. Specifically, his research attempted to understand if the change in attitude resulting from external stimuli was a temporary superficial change or a more lasting change that became integrated in the person's value system. He suggested that changes in attitudes and actions produced by social influences may occur at different "levels." In his view, the nature or level of changes that took place correspond to differences in the *process* whereby the individual accepts influence (or "conforms"). In other words, the underlying processes in which an individual engages when he adopts induced behavior may be different, even though the resulting overt behavior may appear the same.

Kelman distinguished between three different processes of social influence that affect individual behavior: compliance, identification, and internalization.

*Compliance*: when an individual adopts the induced behavior not because she believes in its content but with the expectation of gaining rewards or avoiding punishments.

*Identification*: when an individual accepts influence because she wants to establish or maintain a satisfying self-defining relationship to another person or group.

*Internalization*: when an individual accepts influence because it is congruent with her value system.

By distinguishing between these processes, one could ascertain if usage behavior is caused by the influence of

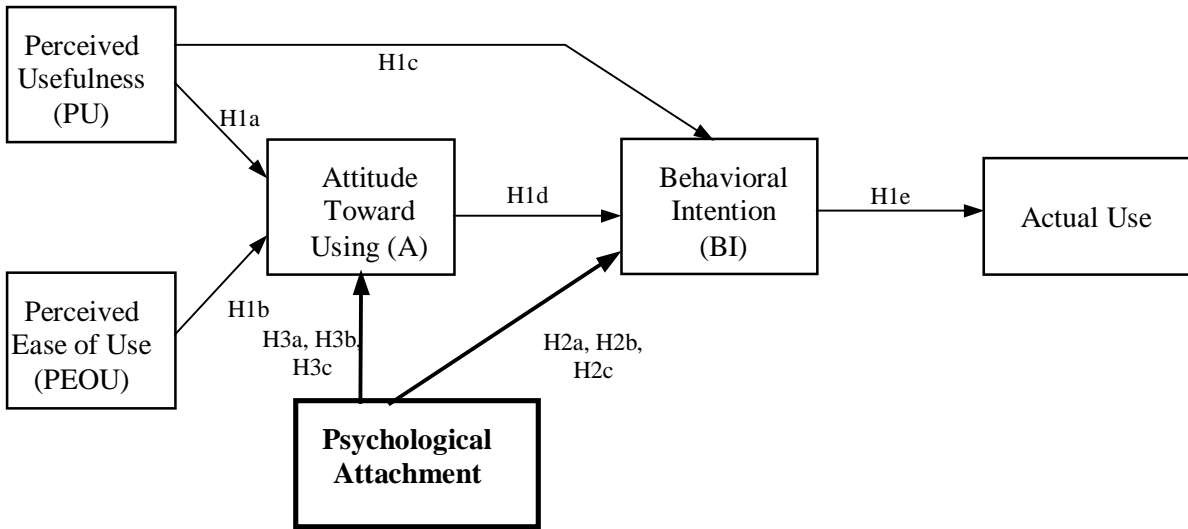
referents on one's intent or by one's own attitude. Kelman [10] observes that each of the above three processes is characterized by a distinctive set of antecedent conditions corresponding to a characteristic pattern of internal responses (thoughts and feelings) in which the individual engages while adopting the induced behavior. Similarly, each of the three processes is characterized by a distinctive set of consequent conditions, involving a particular qualitative variation in the subsequent history of the induced response. For instance, behavior induced through compliance tends to be performed under surveillance by the influencing agent. In contrast, behavior induced through identification tends to be performed under salience of one's relationship with the agent; and behavior induced through internalization tends to be performed under conditions of the relevance of the issue, regardless of surveillance or salience.

Applied to use of a new information system, the social influence processes determine the individual user's *commitment*, or more specifically, *psychological attachment* [17], to the use of any new information technology. Users who perceive use of the information system to be congruent with their values are likely to be internalized -- committed and enthusiastic -- in their system use. However, individuals who perceive such use merely as a means to obtain rewards and avoid punishments are likely to be compliant -- pro forma and uninvested -- in their system use [12]. In contrast to the traditional conception of use in terms of use and non-use, this conception suggests that use of an information system needs to be viewed as a *continuum*. This continuum defines the range from avoidance of use (nonuse) to meager and unenthusiastic use (compliant use) to skilled, enthusiastic and consistent use (committed use). The continuum of use is influenced by users' commitment to the use of the information system: a function of the perceived fit of the system use to the users' values.

The object of this study is to develop the theoretical bases for understanding the role of social influences in TAM in terms of Kelman's social influence processes. This extension of TAM attempts to enrich TAM's ability to explain and predict technology acceptance and use.

### 4. Research Model and Research Hypotheses

The research model for this study is the TAM model, plus an extension derived from Kelman's processes of social influence. This extension is called *psychological attachment*, containing the influence of social influence processes on user's behavioral intentions and attitudes toward using the technology. These social influence processes affect the individual resulting in his or her internalization, identification and compliance with the induced behavior.



**Figure 2. Research Model: TAM Extended to Account for Social Influences**

Psychological attachment is the construct of interest because it operationalizes how various social influence processes affect the person's commitment to the use of the information system [17]. Psychological attachment to use of the information system represents the perceived fit of the system use to the users' value system as discussed above: it is highest in the case of internalization and lowest in the case of compliance.

TAM is used as the baseline model and results in the following hypothesized relationships.

**H1a:** *There will be a positive relationship between Perceived Usefulness and Attitude Toward Using the system.*

**H1b:** *There will be a positive relationship between Perceived Ease of Use and Attitude Toward Using the system.*

**H1c:** *There will be a positive relationship between Perceived Usefulness and Behavioral Intention to use the system.*

**H1d:** *There will be a positive relationship between Attitude Toward Using and Behavioral Intention to use the system.*

**H1e:** *There will be a positive relationship between Behavioral Intention to use the system and Actual Use.*

Based on Kelman's framework, Davis et al. [6, p. 986] had noted that social influences may affect behavioral intention (BI) indirectly via attitude (A), due to *internalization* and *identification* processes, or influence BI directly via *compliance*. Based on the proposed construct of Psychological Attachment, we hypothesize the following relationships. The basic assumption is that all the three processes of social influence will have a

positive effect on Behavioral Intention as well as Attitude, which in turn will affect usage behavior. Empirical support of the hypothesized relationships would distinguish between the role of the three processes of social influences in shaping Behavioral Intention and Attitude.

**H2a:** *There will be a positive relationship between Compliance and Behavioral Intention.*

**H2b:** *There will be a positive relationship between Internalization and Behavioral Intention.*

**H2c:** *There will be a positive relationship between Identification and Behavioral Intention.*

**H3a:** *There will be a positive relationship between Compliance and Attitude Toward Using.*

**H3b:** *There will be a positive relationship between Internalization and Attitude Toward Using.*

**H3c:** *There will be a positive relationship between Identification and Attitude Toward Using.*

## 5. Research Method

The objective of the field study was to contribute to extension of TAM. Hence, efforts were made to keep the research method very similar to that used by earlier studies on TAM to maintain the continuity of the research program.

### 5.1. Field Study Site and Data Collection

The focal information system is a Windows NT based MS-Exchange application implemented in a U.S. national healthcare organization composed of several major urban hospitals located in a Midwestern state. Within this implementation, MS-Exchange is treated as one

groupware package intended to facilitate enterprisewide communication, coordination and collaboration. The system's implementation included the training of users from various component hospitals and their respective departments. During the training session, the users were expected to learn new skills and then practice these skills in hands-on exercises. One important expectation from training was that the users would return to their jobs with new skills and their resulting use of the system would result in immediate improvements in their effectiveness and productivity.

Data were collected from the questionnaires completed by the users participating in the training sessions. Because the users attending these training sessions were targeted as respondents to the questionnaire survey, the sampling method may be described as judgment sampling or purposive sampling [3, p. 540-542]. In this sampling plan, sample elements are selected because they are believed to be representatives of the population of interest and are expected to serve the research purpose of this study.

Over a duration of six weeks, 35 training sessions were conducted in which 239 potential users of MS-Exchange and Schedule+ participated on a self-selected basis. During each training session, the survey questionnaires were handed by the instructor to the trainees who were expected to complete the questionnaire at the end of the training session. These surveys were returned to the instructor before the trainees left the classroom. Overall, of 239 questionnaires that were handed out during these training sessions, 208 usable questionnaires were received that were used for data analyses, thus giving a response rate of over 87%.

## 5.2 Instrument Used for Data Collection

The questionnaire used for data collection contained scales to measure the various constructs depicted in the research model. These scales are shown in Appendix 1. The scales for PEOU, PU, Behavioral Intentions, Attitude Toward Using and Actual Use were adapted from prior studies, many of which have already established their reliability and validity (cf. Davis [5], Davis [6], Mathieson [13], Moore and Benbasat [15], Taylor & Todd [21], Venkatesh & Davis [23]). The measures for Psychological Attachment are based on existing research on the relationship between Kelman's processes of social influence and individual behavior.

Various items within the same construct group were randomized to prevent systemic response bias. Pre-testing and pilot testing of the measures was done by employing selected users from the field setting as well as selected experts in the information systems research area. These individuals included IS and research methodology experts who are well-versed with the selection and design of such measures, organizational managers who are familiar with

the implementation context of the system, and professional trainers conducting the training on the new system.

Perceived Ease of Use is defined as "the degree to which a person believes that using a particular system would be free of effort" [5, p. 320] and is measured using scales used in prior studies on TAM. Perceived Usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [5, p. 320]. Behavioral Intention is the measure of the strength of one's intention to perform a specified behavior [e.g. 7, p. 288]. Attitude is defined as the individual user's positive or negative feelings (evaluative affect) about performing the target behavior [7, p. 216]. Actual Use is measured in terms of frequency of system use ('how often') and the volume of system use ('how much') by the user. Similar measures have been used in most of the existing research studies on TAM, including [5] and [6].

Psychological Attachment is defined as the degree of commitment of the IS user toward system use based on the effect of social influences on his or her behavior. It is measured in terms of compliance, identification and internalization -- Kelman's three processes of social influence. The 12-item scale to measure compliance, identification and internalization in the organizational commitment context developed by O'Reilly and Chatman [17] and validated by Becker et al. [2] and Vandenberg et al. [22] was adapted for measuring Psychological Attachment in the context of IS acceptance.

Responses were coded by two separate coders on the common standard spreadsheet template based on the questionnaire items. Each validated the coded data by proof-reading the entries after they were typed. The responses for items that were administered in reverse order were entered in the correct order. The responses were unrandomized for the randomized items using a reverse-randomization spreadsheet template created for the study. The final data inputs were loaded into a statistical package (SPSS 7.0) for doing various statistical analyses.

The refinement of measures for the TAM constructs and the proposed construct of Psychological Attachment followed Churchill's [3] eight-step procedure. Principal components analysis and maximum likelihood analysis using both varimax and oblimin rotations were used and compared for each of the proposed constructs as well as the pre-existing constructs that have been suggested in prior research on TAM. Distinct factors resulting from principal components analyses were confirmed from the corresponding scree test plots. Cronbach's alpha was used for determining the reliability of individual scales and subscales. Convergent validity and discriminant validity of the measures was verified by observing the correlations between the items on the various scales. All pre-existing constructs used in TAM met the criteria of validity and reliability. Factor analyses provided evidence of distinct

loadings of various factors and convergent and discriminant validity based on inter-item correlations. Alpha for prior constructs are as follows: .899 for Attitude, .960 for PU, .961 for PEOU, and .832 for BI.

## 6. Results

### 6.1. Development of Measure for Social Influence

The principal component analysis with varimax rotation for the proposed construct of Psychological Attachment yielded 2 distinct factors instead of the 3 proposed factors: Compliance, Identification, and Internalization. All four items for Compliance loaded on a distinct factor, however, the three items of Identification and three items of Internalization loaded together on another factor.

Factor loadings for all variables, which represent the correlations between the variables and the respective factors, are greater than 0.55 and are thus considered high [16]. Together, the two observed factors account for 60.31%. The scree test plot verifies the presence of the two distinct factors having eigenvalues greater than 1. This observation is consistent with O'Reilly, Chatman and Caldwell [18] and Sutton and Harrison [20], whose empirical validation of compliance, identification and internalization as dimensions of organizational commitment, yielded similar two-factor solutions.

**Rotated Component Matrix<sup>a</sup>**

|       | Component |          |
|-------|-----------|----------|
|       | 1         | 2        |
| IDEN1 | .839      | 1.36E-02 |
| INT3  | .834      | 6.76E-02 |
| IDEN2 | .831      | 4.21E-02 |
| INT1  | .739      | .164     |
| IDEN3 | .708      | .222     |
| INT2  | .669      | -.171    |
| COMP1 | -.199     | .791     |
| COMP2 | .304      | .752     |
| COMP3 | -4.7E-02  | .715     |
| COMP4 | .424      | .562     |

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Alpha for the Psychological Attachment instrument composed of the original 10 items is .8047. Alphas for the three original subscales underlying Psychological

Attachment are: Compliance: .7043; Identification: .8010; Internalization: .7234. However, when the two scales for Identification and Internalization are combined, their composite reliability is higher than either of the two. Alpha for the combined IDIN (Identification + Internalization) scale is .8690. Because all ten proposed items for Psychological Attachment construct have high loadings, and the two scales achieved after factor extraction have high reliability, all ten proposed items of this construct were retained in the refined instrument. This observation was also verified by examining the factor loadings of individual items on the two factors that were extracted from the principal components analysis. It was also verified that the two observed factors are distinct, because the items within the scales correlate highly and the items across the scales have low correlations. Specifically, a high correlation was found among the items of the Compliance scale as well as among the (Identification + Internalization) scale and a low correlation was found across the items of the two factors. Convergent validity and discriminant validity of the measures was thus verified by observing the correlations between the variables of possibly overlapping components.

### 6.2. Role of Social Influence in Information Systems Acceptance & Usage

The hypothesized relationships depicted in Figure 2 were tested using multiple linear regressions to maintain consistency with earlier studies that have developed and extended TAM. The hypothesized relationships can be represented in terms of the following regression equations:

$$H1a, H1b, H3a, H3b, H3c: A = \beta_0 + \beta_1PU + \beta_2PEOU + \beta_3PA + \epsilon$$

$$H1c, H1d, H2a, H2b, H2c: BI = \beta_0 + \beta_1PU + \beta_2A + \beta_3PA + \epsilon$$

$$H1e: ISUSE = \beta_0 + \beta_1BI + \epsilon$$

where :

A = Attitude; BI = Behavioral Intention; PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PA = Psychological Attachment; and ISUSE = Actual Use.

The findings reported here are based on the analysis of 208 usable responses collected from the respondents. Given that users were introduced to the new information system in the course of their training, the questionnaire items tapped their future expectations of the use of the new system. This premise seems reasonable given that

TAM considers behavioral intentions of the information systems users as reliable predictors of future system usage.

For each of the above regression equations, four multiple regression models using different variable selection methods were developed. The four variable selection methods that were used for each of the multiple regression models were: entering all variables in a single block, forward variable selection, backward variable selection and stepwise variable entry.

**6.2.1 Influence on Attitude**

$$H1a, H1b, H3a, H3b, H3c: A = \beta_0 + \beta_1PU + \beta_2PEOU + \beta_3PA + \epsilon$$

Entering all variables in a single block, we find the following regression results.

Attachment, influence user's attitude toward using the information system.

While compliance has a negative influence on Attitude, Internalization and Identification have a much stronger positive influence on Attitude. In particular, based on the t-values and the significance levels, one may suggest that IDIN component, followed by PEOU, are the strongest predictors of A. PU and COMP play a relatively marginal role in prediction and explanation of A.

**Conclusions:** H1a is not rejected  
 H1b is not rejected  
 H3a is rejected  
 3b and H3c are not rejected

The positive influence of PU and PEOU on A as suggested by original TAM are confirmed by our observations.

**Model Summary<sup>b</sup>**

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics |          |     |     |               | Durbin-Watson |
|-------|-------------------|----------|-------------------|----------------------------|-------------------|----------|-----|-----|---------------|---------------|
|       |                   |          |                   |                            | R Square Change   | F Change | df1 | df2 | Sig. F Change |               |
| 1     | .594 <sup>a</sup> | .353     | .337              | .79                        | .353              | 22.743   | 4   | 167 | .000          | 2.179         |

a. Predictors: (Constant), IDIN, COMP, PEOU, PU  
 b. Dependent Variable: A

**Coefficients<sup>a</sup>**

| Model |      | Unstandardized Coefficients |            | Standardized Coefficients | t      | Sig. | 95% Confidence Interval for B |             | Collinearity Statistics |       |
|-------|------|-----------------------------|------------|---------------------------|--------|------|-------------------------------|-------------|-------------------------|-------|
|       |      | B                           | Std. Error | Beta                      |        |      | Lower Bound                   | Upper Bound | Tolerance               | VIF   |
|       |      | 1                           | (Constant) | 3.190                     |        |      | .403                          |             | 7.912                   | .000  |
|       | PU   | .108                        | .065       | .138                      | 1.664  | .098 | -.020                         | .237        | .565                    | 1.770 |
|       | PEOU | .281                        | .081       | .284                      | 3.483  | .001 | .122                          | .441        | .585                    | 1.710 |
|       | COMP | -.110                       | .060       | -.122                     | -1.819 | .071 | -.229                         | .009        | .867                    | 1.153 |
|       | IDIN | .248                        | .061       | .304                      | 4.068  | .000 | .128                          | .369        | .695                    | 1.440 |

a. Dependent Variable: A

The coefficients for the final model are reported above and the model is represented by:

$$A = 3.190 + 0.108 PU + 0.281 PEOU - 0.110 COMP + 0.248 IDIN \quad R\text{-square} = .353$$

It is observed that at 10% significance level, both COMP and IDIN, the constructs representing Psychological

Furthermore, it is observed that IDIN (Identification + Internalization) has a strong positive relationship with A, while COMP (Compliance) has a weaker negative relationship with A.

**6.2.2. Influence on Behavioral Intention**

$$H1c, H1d, H2a, H2b, H2c: BI = \beta_0 + \beta_1PU + \beta_2A + \beta_3PA + \epsilon$$

Entering all variables in a single block and eliminating poor predictors, we obtain the following model -- which is also found to be the optimal model as a result of stepwise regression:  $BI = 1.621 + .421 PU + .296 A$   
 R-square: .422

### 7. Discussion

The findings of this study suggest that social influences play an important role in determining the acceptance and usage behavior of new adopters of new information technologies.

Model Summary<sup>a</sup>

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics |          |     |     |               | Durbin-Watson |
|-------|-------------------|----------|-------------------|----------------------------|-------------------|----------|-----|-----|---------------|---------------|
|       |                   |          |                   |                            | R Square Change   | F Change | df1 | df2 | Sig. F Change |               |
| 1     | .604 <sup>a</sup> | .365     | .362              | .85                        | .365              | 100.101  | 1   | 174 | .000          |               |
| 2     | .650 <sup>b</sup> | .422     | .415              | .81                        | .057              | 16.986   | 1   | 173 | .000          | 2.205         |

- a. Predictors: (Constant), PU
- b. Predictors: (Constant), PU, A
- c. Dependent Variable: BI

Coefficients<sup>a</sup>

| Model |            | Unstandardized Coefficients |            | Standardized Coefficients | t      | Sig. | 95% Confidence Interval for B |             | Collinearity Statistics |       |
|-------|------------|-----------------------------|------------|---------------------------|--------|------|-------------------------------|-------------|-------------------------|-------|
|       |            | B                           | Std. Error |                           |        |      | Lower Bound                   | Upper Bound | Tolerance               | VIF   |
|       |            | Beta                        |            |                           |        |      |                               |             |                         |       |
| 1     | (Constant) | 2.874                       | .283       |                           | 10.150 | .000 | 2.315                         | 3.433       |                         |       |
|       | PU         | .524                        | .052       | .604                      | 10.005 | .000 | .421                          | .627        | 1.000                   | 1.000 |
| 2     | (Constant) | 1.621                       | .407       |                           | 3.979  | .000 | .817                          | 2.425       |                         |       |
|       | PU         | .421                        | .056       | .485                      | 7.512  | .000 | .310                          | .531        | .800                    | 1.249 |
|       | A          | .296                        | .072       | .266                      | 4.121  | .000 | .154                          | .437        | .800                    | 1.249 |

- a. Dependent Variable: BI

The positive influence of PU and A suggested by TAM is confirmed by our findings. However, social influences do not seem to have any direct relationship with BI.

**Conclusions:** H1c is not rejected  
 H1d is not rejected  
 H2a, H2b and H2c are rejected

#### 6.2.3. Influence on IS Use

H1e:  $ISUSE = \beta_0 + \beta_1 BI + \epsilon$

Entering all variables in a single block, we obtain the following model:  
 $ISUSE = .983 + .716 BI$  R-square=.497  
 14.225 t-values 0.000 sig.

The positive relationship between BI and ISUSE suggested by TAM is verified by our findings.

**Conclusions:** H1e is not rejected.

When social influences generate a feeling of compliance, they seem to have a negative influence on the users' attitude toward use of the new information system. However, when social influences generate a feeling of internalization and identification on the part of the user, they have a positive influence on the attitude toward the acceptance and use of the new system. The findings also suggest that internalization of the induced behavior by the adopters of new information system plays a stronger role in shaping acceptance and usage behavior than perceived usefulness (PU). Hence the consideration of social influences and how they affect the commitment of the user toward use of the information system seems important for understanding, explaining and predicting system usage and acceptance behavior.

When TAM is applied to collaborative systems, it is often observed that the belief structures (perceived ease-of-use and perceived usefulness) are not stable. Based on the theory discussed in this paper and the corresponding findings, it seems that the influence of these belief



structures act in combination with the effect of social influences to determine the use of the system. Specifically, as observed above, internalization of the use of the new system may have a stronger influence on attitude toward the use of the new information system than perceived ease of use. We believe that consideration of social influences and resulting psychological attachment of the user to system use can facilitate better understanding of this issue by accounting for the variance in attitude.

Surprisingly, the study did not show any statistically significant relationship between social influences and behavioral intentions. Two possible explanations might account for this observation. First, attitudes represent the value system of the users and the effect of the social influence on the fit of the use of the new technology with the user's value system seems prominent. This explanation is consistent with Klein and Sorra's [12] suggestion that such 'innovation-values fit' influences commitment of the user toward use of the new system which in turn determines if the acceptance and usage behavior reflects meager and unenthusiastic use (compliant use) or skilled, enthusiastic and consistent use (committed use). Second, behavioral intentions are indirectly affected by attitude: although social influences don't exhibit any statistically significant direct affect on behavioral intention, such influences indirectly affect behavioral intention through attitudes.

Based on the findings of this study, it appears that Kelman's three processes of social influence have direct effects on the users' attitude and indirect effects on their behavioral intention via attitude. This observation offers some contrast to Davis et al.'s [6, p. 986] original anticipation that such social influences may affect behavioral intention (BI) indirectly via attitude (A), due to *internalization* and *identification* processes, and may influence BI directly via *compliance*. In this study, all three social influence processes were found to have direct effects on Attitude although no direct effects of these processes on Behavioral Intention were observed. However, it seems that the three processes of social influence have indirect effects on Behavioral Intention through Attitude. Hence, it seems that the key emphasis of innovation adoption and diffusion initiatives should be on developing user attitudes that are conducive to effective utilization and acceptance behaviors. More definitive understanding of these relationships needs to be developed in future research informed by the conceptual and theoretical bases developed in this study.

The study has significant implications for the question often asked by IS practitioners: 'Why do users of new information systems often exhibit ineffective acceptance and usage behavior thus resulting in marginal or negligible performance improvements resulting from technology implementation' [cf: 8]. Based on our discussion, it may be suggested that there could be two possible explanations for

this conundrum. First, decisions about adoption of new information technologies are often made by top executives at the corporate headquarters or by the top executives in the information systems divisions. Such decisions often do not involve the individual end users in the process. Left out of the decision-making process, users are not personally invested in the use of the new information systems. Second, the users may also lack an in-depth understanding of the capabilities of the new information systems thus resulting in less than optimal utilization of the functionalities afforded by the systems. In such scenarios, users often act in compliance with the top managers' instructions, and their attitude is not derived from identification or internalization with the use of the new technologies. However, as suggested by our findings, social influences that generate a feeling of compliance seem to negatively influence users' attitude toward use of the new information system. In contrast, users' personal investment in use of the new systems and their better appreciation of the capabilities of the system would yield internalization and identification that have a positive affect on the attitude toward system use.

In contrast with existing research on TAM that has observed expected usage to be a reliable predictor of future actual use of technology, some researchers (cf: Melone 1990; Robertson 1989; Schewe 1976) have argued that *observed* behavior may not always be consistent with underlying psychological dispositions. They note that under such circumstances [for example, in case of compliance], *physical* behavior observed in terms of quantity of use, may not serve as a reliable surrogate for *psychological disposition* toward the utilization of the IS or its effectiveness. Our findings suggest that expectations of future use based on internalization and identification [being more deeply embedded in the users' value system] would be highly correlated with actual system use. In contrast, expectations of future use based on compliance will be less correlated with actual system use. Hence, the proposed conceptualization develops a better understanding of the linkage between expected use and future use, and the analyses lend credence to the hypothesized influence of attitude and intention of expected use. In addition, the proposed conceptualization of a *continuum of use* involves both quantitative and qualitative aspects of system use and thus provides a better framework than the current emphasis on quantity of use (Szajna 1996). By explicitly addressing effectiveness of system use, it also develops the bases for understanding Seddon's (1997) rationale that the critical factor for IS performance is not system use, but the net benefits that flow from its use.

Future research is needed to better understand how organizations can facilitate greater commitment of users to effective use of new information technologies. There are some possible lines of research that are suggested for

developing better understanding of this topic. First, organizations may allow opportunities for end users to participate in the decision to adopt the new information systems. Such participation increases the likelihood that the chosen information system fits their preexisting values. Second, an organization may foster a higher level of commitment of end users by educating them about the need and relevance of chosen information technologies for individual and organizational performance. However, technology champions need to be aware that different users may value different aspects of new information system use as relevant to their particular perceptions of individual and organizational goals. While some users may be more motivated by the impact of system use on immediate job performance, others may be more motivated by issues such as long-term effects of using technology on their personal development and growth.

Effective use of new information technologies is likely to require more than simple compliance. A failure to develop psychological attachment among potential users may require the organization to bear the increased costs associated with more sophisticated control systems and/or diminishing performance returns on increasing information technology investments. Having a user base that shares the values underlying effective use of new information systems can ensure that users act instinctively to utilize information technology in an effective manner. Given the ongoing trend toward end-user computing and greater role of users' self-determination in interacting with increasingly flexible technologies in remote and virtual environments, the theory of social influences seems to offer a rich understanding of user behavior in the implementation of new communication, coordination and collaboration technologies.

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## Appendix 1: Scales For Measuring Various Constructs

### Perceived Ease of Use

|   | very<br>likely<br>(VL) | likely<br>(L) | unlikely<br>(U) | very<br>unlikely<br>(VU) |
|---|------------------------|---------------|-----------------|--------------------------|
| 1. Learning to operate MS-Exchange and Schedule+ is easy for me.              | 7                      | 6             | 5               | 4 3 2 1                  |
| 4. I find MS-Exchange and Schedule+ to be flexible to interact with.          | 7                      | 6             | 5               | 4 3 2 1                  |
| 2. I find it easy to get MS-Exchange and Schedule+ to do what I want to do.   | 7                      | 6             | 5               | 4 3 2 1                  |
| 5. It is easy for me to become skillful at using MS-Exchange and Schedule+.   | 7                      | 6             | 5               | 4 3 2 1                  |
| 6. I find MS-Exchange and Schedule+ easy to use.                              | 7                      | 6             | 5               | 4 3 2 1                  |
| 3. My interaction with MS-Exchange and Schedule+ is clear and understandable. | 7                      | 6             | 5               | 4 3 2 1                  |

### Perceived Usefulness

|  | very<br>likely<br>(VL) | likely<br>(L) | unlikely<br>(U) | very<br>unlikely<br>(VU) |
|--|------------------------|---------------|-----------------|--------------------------|
| 8. Using MS-Exchange and Schedule+ would improve my job performance.                           | 7                      | 6             | 5               | 4 3 2 1                  |
| 7. Using MS-Exchange and Schedule+ in my job would enable me to accomplish tasks more quickly. | 7                      | 6             | 5               | 4 3 2 1                  |
| 12. I would find MS-Exchange and Schedule+ useful in my job.                                   | 7                      | 6             | 5               | 4 3 2 1                  |
| 9. Using MS-Exchange and Schedule+ in my job would increase my productivity.                   | 7                      | 6             | 5               | 4 3 2 1                  |
| 10. Using MS-Exchange and Schedule+ would enhance my effectiveness on the job.                 | 7                      | 6             | 5               | 4 3 2 1                  |
| 11. Using MS-Exchange and Schedule+ would make it easier to do my job.                         | 7                      | 6             | 5               | 4 3 2 1                  |

### Actual Use

2. How many times do you believe you use MS-Exchange and Schedule+ during a week?

|            |           |        |        |         |       |            |  |
|------------|-----------|--------|--------|---------|-------|------------|--|
|            |           |        |        |         |       |            |  |
| not at all | less than | about  | 2 or 3 | several | about | several    |  |
|            | once a    | once a | times  | times   | once  | times each |  |
|            | week      | week   | a week | a week  | a day | day        |  |

3. How many hours do you believe you use MS-Exchange and Schedule+ every week?

|           |          |           |           |           |           |         |
|-----------|----------|-----------|-----------|-----------|-----------|---------|
|           |          |           |           |           |           |         |
| less than | between  | between   | between   | between   | more than |         |
| 1 hr.     | 1-5 hrs. | 5-10 hrs. | 10-15 hrs | 15-20 hrs | 20-25 hrs | 25 hrs. |

1. How frequently do you believe you use MS-Exchange and Schedule+?

|           |       |          |         |          |       |  |            |
|-----------|-------|----------|---------|----------|-------|--|------------|
|           |       |          |         |          |       |  |            |
| frequent  |       |          |         |          |       |  | infrequent |
| extremely | quite | slightly | neither | slightly | quite |  | extremely  |

### Behavioral Intentions

|   | strongly<br>agree<br>(SA) | agree<br>(A) | disagree<br>(U) | disagree<br>(D) | strongly<br>disagree<br>(SD) |
|---|---------------------------|--------------|-----------------|-----------------|------------------------------|
| 2. I intend to use MS-Exchange and Schedule+ for communicating with others. | 7                         | 6            | 5               | 4 3 2           | 1                            |
|   | (SA)                      |              |                 |                 | (SD)                         |

- |   |      |   |   |   |   |   |      |
|---|------|---|---|---|---|---|------|
| 4. I intend to use MS-Exchange and Schedule+ <i>frequently</i> in my job. | 7    | 6 | 5 | 4 | 3 | 2 | 1    |
|   | (SA) |   |   |   |   |   | (SD) |
| 1. I intend to use MS-Exchange and Schedule+ in doing my job.             | 7    | 6 | 5 | 4 | 3 | 2 | 1    |
|   | (SA) |   |   |   |   |   | (SD) |
| 3. I intend to use MS-Exchange and Schedule+ for planning meetings.       | 7    | 6 | 5 | 4 | 3 | 2 | 1    |
|   | (SA) |   |   |   |   |   | (SD) |

**Attitude Toward Using**

Please **check (X) your response** about using MS-Exchange & Schedule+ **on the following four scales** based upon what you think to be the most appropriate response for filling in the blank.

All things considered, my using MS-Exchange and Schedule+ in my job is a(n) \_\_\_\_\_ idea.

- |             |           |       |          |         |          |       |           |            |
|-------------|-----------|-------|----------|---------|----------|-------|-----------|------------|
| 3. Wise     |           |       |          |         |          |       |           | Foolish    |
|             | extremely | quite | slightly | neither | slightly | quite | extremely |            |
| 4. Negative |           |       |          |         |          |       |           | Positive   |
|             | extremely | quite | slightly | neither | slightly | quite | extremely |            |
| 2. Harmful  |           |       |          |         |          |       |           | Beneficial |
|             | extremely | quite | slightly | neither | slightly | quite | extremely |            |
| 1. Good     |           |       |          |         |          |       |           | Bad        |
|             | extremely | quite | slightly | neither | slightly | quite | extremely |            |

**Measurement Scales for Psychological Attachment**

**Internalization**

- |  |          |       |          |          |   |   |          |
|--|----------|-------|----------|----------|---|---|----------|
|  | strongly |       |          |          |   |   | strongly |
|  | agree    | agree | disagree | disagree |   |   |          |
|  | (SA)     | (A)   | (U)      | (D)      |   |   | (SD)     |
| 2. What the use of MS-Exchange and Schedule+ stands for is important for me.   | 7        | 6     | 5        | 4        | 3 | 2 | 1        |
|  | (SA)     |       |          |          |   |   | (SD)     |
| 1. The reason I prefer use of MS-Exchange and Schedule+ is because of the underlying organizational values.                                | 7        | 6     | 5        | 4        | 3 | 2 | 1        |
|  | (SA)     |       |          |          |   |   | (SD)     |
| 3. I like using MS-Exchange and Schedule+ primarily based on the similarity of my values and the organizational values underlying its use. | 7        | 6     | 5        | 4        | 3 | 2 | 1        |
|  | (SA)     |       |          |          |   |   | (SD)     |

**Identification**

- |   |          |       |          |          |   |   |          |
|---|----------|-------|----------|----------|---|---|----------|
|   | strongly |       |          |          |   |   | strongly |
|   | agree    | agree | disagree | disagree |   |   |          |
|   | (SA)     | (A)   | (U)      | (D)      |   |   | (SD)     |
| 6. I feel a sense of personal ownership about the use of MS-Exchange and Schedule+. | 7        | 6     | 5        | 4        | 3 | 2 | 1        |
|   | (SA)     |       |          |          |   |   | (SD)     |
| 5. I talk up the use of MS-Exchange and Schedule+ to my colleagues as a great use.  | 7        | 6     | 5        | 4        | 3 | 2 | 1        |
|   | (SA)     |       |          |          |   |   | (SD)     |
| 4. I am proud about using MS-Exchange and Schedule+.                                | 7        | 6     | 5        | 4        | 3 | 2 | 1        |
|   | (SA)     |       |          |          |   |   | (SD)     |

**Compliance**

- |   |          |       |          |          |   |   |          |
|---|----------|-------|----------|----------|---|---|----------|
|   | strongly |       |          |          |   |   | strongly |
|   | agree    | agree | disagree | disagree |   |   |          |
|   | (SA)     | (A)   | (U)      | (D)      |   |   | (SD)     |
| 9. My private views about use of MS-Exchange and Schedule+ are different than those I express publicly. | 7        | 6     | 5        | 4        | 3 | 2 | 1        |
|   | (SA)     |       |          |          |   |   | (SD)     |

- |  |           |   |   |   |   |   |           |
|--|-----------|---|---|---|---|---|-----------|
| 7. Unless I'm rewarded for using MS-Exchange and Schedule+ in some way, I see no reason to spend extra effort in using it. | 7<br>(SA) | 6 | 5 | 4 | 3 | 2 | 1<br>(SD) |
| 10. In order for me to get rewarded in my job, it is necessary to use MS-Exchange and Schedule+.                           | 7<br>(SA) | 6 | 5 | 4 | 3 | 2 | 1<br>(SD) |
| 8. How hard I work on using MS-Exchange and Schedule+ is directly linked to how much I am rewarded.                        | 7<br>(SA) | 6 | 5 | 4 | 3 | 2 | 1<br>(SD) |