User Resistance of Information Systems
- A Multi-level Model Approach

Tungching Lin

and

Shih Hui Lo

Institute of Business Management
National Sun Yat-Sen University

Abstract

User resistance has been recognized as a critical factor for the success of information systems implementation. Many theories or models have been proposed to explain and analyze the reasons for user resistance, but some limitations exist in previous models. These limitations include variables/dimensions being too limited, no consideration about the interaction among independent variables, dimensions are created based only on the author's subjective opinion and so on. The purpose of this research is to create a comprehensive research model which can test and explain the user resistance phenomenon. By using the factor analysis technique, sixteen variables in this study were classified into six dimensions (factors) such as System Technique factor, User factor, Organizational factor, Existence Relatedness factor, Growth factor, and User Involvement factor were used as intermediate factors and User Acceptance factor was used as dependent variable. A multivariate analysis technique called Path Analysis is used to test the statistical significance among those relationships. The results indicate the factor and the Growth factor have a significant impact on User Involvement (Intermediate Variable). Conversely, the System Technique factor, System performance factor, the User Existence factor, and User Growth factor have significantly affected user acceptance of the information system.

I. Introduction

User resistance has been recognized as a critical factor for the successful of information systems. Many theories or models have been proposed to explain and analyze the reasons for user resistance, but some limitations exist in previous models. These limitations include variables/dimensions which are too restricted, no
consideration is given to the interaction among independent variables, dimensions are created based only on the author's subjective opinion and so on. The purpose of this research is to create a comprehensive research model which can test and explain the user resistance phenomenon.

The research model created in this study has the following characteristics:

1. Comprehensiveness: it covers multiple dimensions such as Organizational factors, User factors and Information System factors.
2. Multi-level: it does not only studies direct relationships among factors but also discusses the indirect relationships between factors.
3. Objectiveness: the factors/dimensions classified in this study are conducted by the scientific method rather than the author's subjective judgment.
4. Theory-based: the integrated model proposed in this study is composed of well-established theories; User Resistance Theory, and Human Need Theory.

II. Literatures Review

Research about user resistance can be categorized into two types: the first is called the single-level approach, the second is the multi-level approach. The single-level approach only considers direct relationships between independent variables and dependent variables. The multi-level approach further considers the interactions of independent variables and indirect relationships between dependent variables and independent variables.

1. The Single-Level Model

Many user resistance theories in this group have been proposed. For example, based on the Equity theory, Joshi [14] created a model called Equity-Implementation Model (EI Model) to discuss why users resist new information systems. By using political struggle and the Power Transfer Theory, Markus [21] proposed an Interaction Theory, which indicated that most of the time user resistance can not be explained by a user's attribute or a technical attribute, and the real reason behind user resistance is found in political factors. Using factor studies Dickson & Wetherbe [6] classified the user resistance factors into three dimensions: Organizational, Technical and Project-Related factors.

Besides these, factors which might have influence on user resistance have been found in many articles. They are as follows:

1. Threatening of status (Hussain & Hussain [11]; Ross, [26].
2. Threatening of self-satisfaction (Ross [26]; Sander [28]).
3. Loss of social status (Sander [28]).
4. Threatening of economics (Hussain & Hussain [11]; Ross [26]; Sander [28]).
6. Loss of individual power (Hussain & Hussain [11]; Ross [26]).
7. Difficulty of system technology (O’Brien [24]; Hussain & Hussain [11]).
8. System performance is not as good as expected (O’Brien, [24]).
9. User Participation in system development/user involvement (O’Brien [24]).
10. Communication between users and information designer (O’Brien [24]).
11. Changing of task (Hussain & Hussain [11]).
12. Changing of decision rules (Hussain & Hussain [11]).
13. Conflict among organizational divisions (O’Brien [24]).

2. The Multi-Level Model

Some researchers (Powers & Dickson [25]; Dickson & Simon [5]; Lucas [17]; DeBrabander & Edstrom [4]; Guthrie [8]; Ives & Olson [13] argue that the single-level model cannot properly represent the real situation in the world, and that the phenomenon of user resistance is more complicated because there might exist intermediate variables and interaction relationships.

Tait and Vessey [31] investigated the role of user involvement and treated it as an intermediate variable to explain user resistance.

The limitations of the Tait & Vessey Model are as follows:
1. Too few variables in each dimension.
2. Lack of organizational and political dimension.
3. No scientific base in dimension selection.

Lucas [18] developed a multi-level model (Descriptive Model) to explain the success of information system implementation.

The model included technical factors, system attributes, decision style, individual and situational factors.

The limitations of Lucas's model are as follows:
1. Dimensions are created by the author's subjective opinion.
2. No consideration about political factors.
3. Relationships among variables are tested one by one separately, ignoring the integrating relationships.
Yaverbaum [32] investigated the characteristics of end users within the context environment.

The limitations of Yaverbaum's model are:
1. No consideration is given to system technical factors.
2. No consideration is provided about political factors.
3. Lack of examination of direct and indirect effects.

3. Theory of Human Need and Motivations is omitted

Besides the user resistance theory mentioned above, another theory used as a basic for this study is the Theory of Human Needs. To motivate the end user to accept and use the system remains one of the most challenging problems faced by the MIS staff. Many theories concerning human motivation and needs have been proposed by the organizational behavior researchers. Examples of these are the Reinforcement Theory (Skinner [30]), Attribute Theory (Heider [9]), Dual Factor Theory (Herzberg [10]), Expectancy Theory (Vroom [31]), and Goal Setting Theory (Locke [15]). Among them, the most highly regarded motivational theory is Maslow's Needs Hierarchy (Maslow [22]). Maslow contended that individuals are motivated by security, social activity, esteem status and self-actualization. According to Maslow, fulfillment of these is hierarchical. Individual fulfill these needs sequentially, starting with psychological needs and ascending up the hierarchy to self-actualization. Based on Maslow's theory, Alderfer [1] created a new theory called the ERG Model (Existence, Relationship, Growth). It involves three sets of needs.

- Existence: needs are satisfied by such factors as food, air, water, and pay.
- Relatedness: needs are satisfied by meaningful social and interpersonal relationships.
- Growth: needs are satisfied by an individual being creative or productive.

Although the ERG Model corresponded to Maslow's hierarchy of needs, it suggested that in addition to the satisfaction-progression process that Maslow proposed, a frustration-regression process is also at work. If a person is continually frustrated in attempts to satisfy Growth needs, Relatedness needs reemerge as a major motivating force, causing the individual to redirect efforts toward satisfying a lower-order need category.

The ERG Model has become very popular because it is consistent with other theories of rational choice and it attributes
freedom to the individual (Salancik & Peffor, 1977).

III Research Method

1. Research Framework and Hypotheses

The initial research framework is as follows: (Figure 1):

![Figure 1: the Initial Research Model of User Resistance]

Two hypotheses concerning the framework are described as below.

H1: User involvement is affected by organizational factors, and system technical factors.

H2: User resistance was determined by system technical factors, ERG need, user's background, organizational factors, and user involvement.

2. Variables Description:

Selected from the previous research (mentioned above) the variables used in the study and their descriptions are classified as follows:

2.1 System Factor

1. System complexity: A system which is too complex would influence user resistance (Dickson & Wetherbe [6]; O'Brien [24]; Hussain & Hussain [11]).

2. Practice time needed: Too much practice time would result in user resistance (Dickson & Wetherbe [6]; Joshi [14]).

3. System accuracy and reliability: Slow responses, crashes, or unavailability will bring about user dissatisfaction (Dickson & Wetherbe [6]).

4. Previous systems experience: Experience will make the system more comfortable to learn and use (Dickson & Wetherbe [6]).

5. Expected system performance: High system performance experiences would result in the user's enthusiasm and acceptance (O'Brien [24]).
2.2 Organizational Factor:

1. Power and control redistribution: Introduction of a new system would result in the transference of organizational power and control and user resistance might thus occur (Dickson & Wetherbe [6]; Hussain & Hussain [11]; Ross [26]; Joshi [14]).

2. Conflict among organizational units: Introduction of a new system sometimes will result in conflicts among the goals and interests of different divisions. This also leads to user resistance (O'Brien [24]; Markus [21]).

2.3 User Factor

1. Age of users: Younger users tend to be more flexible and more easily accept the new stimulus (Lucas [16]; Fuerst & Cheney [7]).

2. Education of users: Highly educated users tend to be more willing to accept new challenges (Lucas [16]).

3. Perception of users about system: If users understand the system process, they will tend to be more likely to accept its implementation (O'Brien [24]; Baroud, et al, [3]).

4. Communication channels: More effective communication channels lead users to accept the system (Magal & Strouble [19]).

5. Related training: Good training courses lead users to be more comfortable with the IS (Sander & Courtent [28]).

2.4 Need factor (Alderfer, 1969)

1. Existence need: Differences in the perceived importance of maintaining economical stability would influence the possibility of acceptance of new challenges.

2. Relatedness need: Differences in the perceived importance of maintaining human relations would also influence the acceptance of change.

3. Growth need: Users with a high growth need tend to accept new challenges.

2.5 User involvement

Six different degrees of involvement are classified in this study (Ives & Olsen [13])

1. No involvement: Users are unwilling or not invited to participate.

2. Symbolic involvement: User input is requested but ignored.
3. Involvement by advice: Advice is solicited through interviews or questionnaires.

4. Involvement by weak control: Users have "sign-off" responsibility at each stage of the system development process.

5. Involvement by doing: A user is a design team member, or is the official "liaison" with the information systems development group.

6. Involvement by strong control: Users may be paid directly for new development out of their own budgets, or the user's overall organizational performance evaluation depends on the outcome of the development effort.

2.6 User Resistance Variables

Many variables have been used to measure the attitude of the user to the system implementation. These include user resistance (Alter [2]), user satisfaction (Power & Dickson [25]; Sartore [29]), user acceptance (Igersheim [12]), and the user's feelings toward IS (Maish [20]. The measurement used in this study is a semantic differential composite scale which contains four items (user resistance, user satisfaction, user acceptance, user's feeling about the system). Therefore in this study user acceptance and resistance are used interchangeably.

Linkert and Semantic differential scales were used to measure most of the responses. For example, meeting user requirement was measured by using:

Does the information provided by the IS meet your requirement?

not at all -----------very much

1 2 3 4 5 6 7

3.2 Research Method

Data Collection

The data was collected using a questionnaire that had previously been pilot-tested initially by ten experienced computer end users, and their opinions were used to eliminate redundancy and clarify ambiguity. The first part of the questionnaire gathered demographic data on the respondent. The second part sought data on the user's background, system's factors and organizational factors. The final section addressed the level of user resistance/acceptance of the IS. Two hundred and fifty questionnaires with cover letters were sent to the participants of the Business Administration Training Program (BATP) offered by the College of Management, National Sun Yat-Sen University (located in
Southern Taiwan). The participants were all full-time employees in industry and were asked to answer the questionnaire only if they had experience in using and involvement in the development of an information system (i.e. an end user of IS). Fifty-six useful responses were obtained for a 23.2% response rate. The demographic data of the subjects are described in Table 1.

**Data Analysis Method**

First, factor analysis was conducted to classify these variables into proper dimensions. Then, path analysis was used to test the causal relationships among them.

**IV Data Analysis**

**1. Factor analysis and Validation**

Factor analysis was used to find the underlying dimensions of independent variables. The principal components of factor analysis yielded four factors. Only the factors which had an eigen value greater than one were selected. The four factors were named as: System Technology Factor (F1), System Quality Factor (F2), User Factor (F3), Organizational Power Factor (F4). The factor loading resulting from a varimax rotation are shown in Table 2 (only the variables in which factor loading was greater than 0.5 were selected). Cronbach alpha coefficients of reliability for the above four factors were calculated (0.84, 0.77, 0.61, 0.60, respectively) and the scores were higher than the coefficient alpha threshold level of 0.60 suggested by Nunally [23]. These results substantially validate that the scales are reliable measures of five related dimensions. Pearson correlation coefficients were also used to test internal consistency among different items used in measuring user resistance (i.e. resistance, satisfaction, acceptance and feeling). The coefficients also validated the scales and are therefore reliable in measuring user resistance (see Table 3).

**2. Path Analysis**

The method used to test the research model was path analysis. This is a multiple regression technique suited to investigate sequential models such as the one proposed in this study (Tait & Vessey [31]). One of the major strengths of path analysis is its ability to distinguish the different effects of one variable on another. For our purpose, path analysis permits the research to determine (1) the direct effects of one variable on another and (2) the indirect effects of the first variable in the second through one or more intermediate variables. Path analysis of the model involves user involvement and user resistance. Finger 2 represents the model and the path coefficient, and Table 4 summarizes the results. The first regression was conducted with user acceptance as an
internal variable, and user involvement, system technical factor, system quality factor, user’s factor and job threatening factors as external variables. Table 5 represent the direct and indirect effects of the model variables on user resistance.

V Results discussion

1. User Involvement

According to the result of path analysis, the user’s background (0.379) and the user’s growth need (0.311) significantly affect user involvement. Other factors, such as system technical factor, system performance, organizational structure factor, user’s existence need and relatedness need, are an insignificant influence as far as involvement is concerned.

2. User Acceptance

System technical factor (0.245), system performance (0.644), user’s background (0.204), user’s existence need (0.200) and growth need (0.368) have significant influence on user acceptance of information systems (see Table 4). The implications are described below:

1. System performance (0.644): Good system performance, such as reliability, accuracy, and user's expectancy for system, will lead to user acceptance of the system.

2. User growth (0.200) and existence need (0.368): The high motivation of the user's growth need will persuade the user to accept the challenge.

<table>
<thead>
<tr>
<th>sex</th>
<th>male: 29(52%)</th>
<th>female: 27(48%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>30 above 20 (36%)</td>
<td>31-40 23 (40%)</td>
</tr>
<tr>
<td>education</td>
<td>high school and below 10 (18%)</td>
<td>training college 23 (40%)</td>
</tr>
<tr>
<td>position</td>
<td>senior manager 11 (20%)</td>
<td>junior manager 16 (29%)</td>
</tr>
<tr>
<td>experience</td>
<td>10 above 15 (27%)</td>
<td>10-5 15 (27%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Data of Respondents
3. System technical factor (0.245): Ease of use, short practice time, and similar experiences on a system will bring about user acceptance.

4. User’s background (0.204): Young and highly educated users tend to more easily accept new challenges.

5. User’s existence need (0.200): If the user has high motivation with respect to economic stability, it will impel him to accept the new challenge.

6. User involvement (0.147): In this research, the influence of user involvement on system acceptance is insignificant. This conclusion confirms the result of Tait and Vessey [31].

<table>
<thead>
<tr>
<th></th>
<th>FACTOR1</th>
<th>FACTOR2</th>
<th>FACTOR3</th>
<th>FACTOR4</th>
</tr>
</thead>
<tbody>
<tr>
<td>System complexity</td>
<td>0.72229</td>
<td>-0.36089</td>
<td>0.13153</td>
<td>0.12982</td>
</tr>
<tr>
<td>Practice time needed</td>
<td>0.62926</td>
<td>-0.00037</td>
<td>0.14191</td>
<td>0.11866</td>
</tr>
<tr>
<td>Related training</td>
<td>0.40535</td>
<td>0.33207</td>
<td>0.13131</td>
<td>0.10860</td>
</tr>
<tr>
<td>Previous systems experience</td>
<td>0.52506</td>
<td>0.02751</td>
<td>0.38147</td>
<td>0.15085</td>
</tr>
<tr>
<td>Communication channels</td>
<td>-0.29480</td>
<td>0.68580</td>
<td>-0.05779</td>
<td>-0.10529</td>
</tr>
<tr>
<td>System accuracy &amp; reliability</td>
<td>-0.44040</td>
<td>0.61960</td>
<td>0.12899</td>
<td>-0.00478</td>
</tr>
<tr>
<td>Expected system performance</td>
<td>0.04783</td>
<td>0.55711</td>
<td>0.07531</td>
<td>0.00197</td>
</tr>
<tr>
<td>User’s education</td>
<td>0.01549</td>
<td>-0.08000</td>
<td>0.69843</td>
<td>-0.00188</td>
</tr>
<tr>
<td>User’s perception of system planning</td>
<td>0.00468</td>
<td>0.18354</td>
<td>0.61593</td>
<td>-0.26011</td>
</tr>
<tr>
<td>User’s age</td>
<td>0.01454</td>
<td>0.08197</td>
<td>0.60282</td>
<td>0.16657</td>
</tr>
<tr>
<td>Conflict among organizational units</td>
<td>0.08544</td>
<td>0.30529</td>
<td>0.17100</td>
<td>0.76779</td>
</tr>
<tr>
<td>Power and control transfer</td>
<td>0.00074</td>
<td>0.16422</td>
<td>-0.11737</td>
<td>0.76183</td>
</tr>
<tr>
<td>Eigen value</td>
<td>3.02429</td>
<td>2.08770</td>
<td>1.69454</td>
<td>1.27685</td>
</tr>
<tr>
<td>Cumulated percentage (%)</td>
<td>25.2%</td>
<td>42.6%</td>
<td>56.7%</td>
<td>67.3%</td>
</tr>
<tr>
<td>Cronbach α</td>
<td>0.8431</td>
<td>0.7710</td>
<td>0.6114</td>
<td>0.6094</td>
</tr>
</tbody>
</table>

Table 2: Result of factor analysis

<table>
<thead>
<tr>
<th>Measurement</th>
<th>UR</th>
<th>US</th>
<th>UA</th>
<th>UF</th>
</tr>
</thead>
<tbody>
<tr>
<td>user resistance (UR)</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>user satisfaction (US)</td>
<td>0.90</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>user acceptance (UA)</td>
<td>0.89</td>
<td>0.86</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>user feeling about IS (UF)</td>
<td>0.79</td>
<td>0.84</td>
<td>0.90</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 3: Matrix of Intercorrelations among the Four Dimensions for the User Resistance Instrument
Figure 2: User Resistance Model of Path Analysis

<table>
<thead>
<tr>
<th>relation (dependent variable/ independent variable)</th>
<th>coefficient</th>
<th>significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1: System technical factor</td>
<td>0.268</td>
<td></td>
</tr>
<tr>
<td>F2: System performance factor</td>
<td>0.223</td>
<td></td>
</tr>
<tr>
<td>F3: User's background</td>
<td>0.379</td>
<td>* 0.0139</td>
</tr>
<tr>
<td>F4: Organizational power factor</td>
<td>0.071</td>
<td></td>
</tr>
<tr>
<td>D1: Existence need of ERG model-E</td>
<td>0.112</td>
<td></td>
</tr>
<tr>
<td>D2: Relation ERG need of ERG model-R</td>
<td>0.109</td>
<td></td>
</tr>
<tr>
<td>D3: Growth ERG need of ERG model-G</td>
<td>0.511</td>
<td>* 0.0380</td>
</tr>
<tr>
<td>/ Y1: User involvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F1: System technical factor</td>
<td>0.245</td>
<td>* 0.0888</td>
</tr>
<tr>
<td>F2: System performance factor</td>
<td>0.644</td>
<td>* 0.0890</td>
</tr>
<tr>
<td>F3: User's background</td>
<td>0.204</td>
<td></td>
</tr>
<tr>
<td>F4: Organizational power factor</td>
<td>0.171</td>
<td></td>
</tr>
<tr>
<td>D1: Existence need of ERG model-E</td>
<td>0.200</td>
<td>* 0.0539</td>
</tr>
<tr>
<td>D2: Relation ERG need of ERG model-R</td>
<td>0.135</td>
<td></td>
</tr>
<tr>
<td>D3: Growth ERG need of ERG model-G</td>
<td>0.368</td>
<td>* 0.0022</td>
</tr>
<tr>
<td>Y1: User involvement</td>
<td>0.146</td>
<td>0.1901</td>
</tr>
</tbody>
</table>

/ Y2: User's acceptance

* "*" refer $\alpha = 0.1$

Table 4: Results of Path analysis
Table 5: The Direct and Indirect effect of Independent Variables Influence on User Acceptance

<table>
<thead>
<tr>
<th></th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1: System technical factor</td>
<td>0.245</td>
<td>0.039</td>
<td>0.206</td>
</tr>
<tr>
<td>F2: System performance factor</td>
<td>0.644</td>
<td>0.033</td>
<td>0.677</td>
</tr>
<tr>
<td>F3: User's background</td>
<td>0.204</td>
<td>0.056</td>
<td>0.148</td>
</tr>
<tr>
<td>F4: Organizational power factor</td>
<td>0.171</td>
<td>0.010</td>
<td>0.181</td>
</tr>
<tr>
<td>D1: Existence need of ERG model-E</td>
<td>0.200</td>
<td>-0.016</td>
<td>0.184</td>
</tr>
<tr>
<td>D2: Relation ERG need of ERG model-R</td>
<td>0.135</td>
<td>0.016</td>
<td>0.151</td>
</tr>
<tr>
<td>D3: Growth ERG need of ERG model-G</td>
<td>0.368</td>
<td>0.046</td>
<td>0.414</td>
</tr>
<tr>
<td>Y1: User involvement</td>
<td>0.147</td>
<td>-</td>
<td>0.147</td>
</tr>
</tbody>
</table>

Table 5: The Direct and Indirect effect of Independent Variables Influence on User Acceptance

VI Conclusion

This study created a multi-level model: direct and indirect effects are to study the factors which affect user resistance. Seven dimensions are included; tested and discussed, and the major factors which have significant influence on user's involvement and user's acceptance are also found and discussed.

The study has some limits that must be mentioned. The size of the sample was evidently not large enough to generalize the results, the measurements used in the study were self-reported as opposed to objectively measured, and due to the large number of variables included in the model, most of the variables are measured only by a single-item scale rather than multiple items. Future research is needed to improve the reliability and validity of the measurement instrument.

Reference


