Structural Equation Modeling Technique for Social Application of Information Technology User Requirements’ Identification

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Abstract. One of the essential phases in software development processes is user requirements identification, commonly using qualitative methods. The Social Application of Information Technology is an implementation of information technology in social related aspects, such as Knowledge Sharing System. In the Social Application of Information Technology, besides elements of functionality but also the accuracy and representativeness of the users’ needs and requirements are important factors. In this study, a quantitative method with Structural Equation Modeling technique was utilized rather than commonly using qualitative methods, in identifying the users’ requirements in the software development of Knowledge Sharing System. Theory of Planned Behavior was used as basic theory. Data collected using questioners, and the sample distribution planned with 95\% level of confidence. Samples selected randomly totaled 82 people from members of the AISEC, Sriwijaya University, Palembang. By counting all hypotheses those were related to the basic theory, results shown that the quantitative method with Structural Equation Modeling technique can be used to identify user needs in an effective, accurate, and precise significant representativeness.

1. Introduction
Software Engineering is one area that explores ways of software development, which use engineering principles or concepts with the aim of producing economically valuable software that is trusted and works efficiently \cite{1-3}. Good software is software that can meet the needs of customers or users. A lot of software is created and ultimately is often not used because it does not meet customer needs or even because of non-technical problems such as software users’ reluctance to change the way the manual or automatic works, or the inability of users to use it. Often a software product is only made from the point of view of software developers who have a tendency to think technically.

The concept of Social Information Technology Application has been developed rapidly. In this concept, a software product not only deals with technological and technical problems where the factors or social aspects those also related to the implementation of an information technology. Knowledge Sharing System is one example which is part of the Knowledge Management System, a tool intended to support Knowledge Management. Knowledge Management can help in creating,
classifying, storing, sharing, and updating knowledge through information technology and generate real value for organizations, groups, or individuals [4]. The continuity of Knowledge Management processes within the organization requires tool as media or channel in the form of Knowledge Sharing System. Knowledge sharing occurs when someone spreads his knowledge (know-what, know-how, and know-why) to other members in the organization [5].

However, peoples do not easily share the knowledge they have; they more enjoying the knowledge that others have. The main problem of individuals who do not want to share their knowledge and expertise because they do not feel the benefits of these activities and also experience difficulties in implementing knowledge sharing as what must be done. For this reason, it is necessary to develop a computer-based information system in the form of applications or software. Dalkir states that Knowledge Management evolved from information management tools that integrate various aspects of computer-supported collaborative work with information documents and management systems [6]. Knowledge Sharing System applications have an important role in encouraging knowledge sharing in organizations because Knowledge Sharing System can be used to facilitate, produce, maintain, and share knowledge with the organization. Knowledge Sharing System as a tool for knowledge sharing emphasizes how the influence of Knowledge Sharing System as the main factor and organizational environment as a supporting factor that can encourage individual attitude to do knowledge sharing [7].

Therefore, it is necessary to understand the factors that motivate individuals to share knowledge voluntarily so that applications developed are in accordance with the needs of Knowledge Sharing System application users. Theory of Planned Behavior shows that attitudes, subjective norms and behavioral perception controls influence intentions in knowledge sharing [8]. So it is clear that the successful implementation of Knowledge Sharing System is very dependent on how software developers can identify and understand the needs of users for the functionality and features that must be presented in the software so that it will be used optimally in supporting the successful implementation. Failure to understand the needs of users in Knowledge Sharing System, it is feared that the process of knowledge sharing in these applications cannot be done optimally.

Especially in the development of software that implements the concept of Social Information Technology, the validity and reliability of testing instruments become a central issue, so that quantitative methods can be better options because of the stages of testing the validity and reliability of instruments (variables and indicators). Structural Equation Modeling Technique can be implemented to identify user requirement in software development, in this case is Knowledge Sharing System, which effectively, accurately, and precisely in measuring factors of latent variables, that is variables that cannot be measured directly [9].

This study discussed how to provide features that should be provided in the development of knowledge sharing applications, based on user needs by implementing Theory of Planned Behavior (TPB), to ensure all user requirements for application development sharing knowledge can be achieved. To answer the problem formulation, then some research questions were prepared: how does the implementation of Theory of Planned Behavior (TPB) influence the intentions and attitudes of individuals towards knowledge sharing behavior?; and what parameters determine the knowledge sharing behavior so that it must be a feature that must be provided in the knowledge sharing application?

2. Materials and Methods
In this study a web-based software application has been developed which is used as a knowledge sharing system for members of AIESEC, Sriwijaya University. For this purpose, in this study quantitative research method was applied. Primary data were obtained through survey questionnaires for students who were active members of AIESEC of Sriwijaya University from 2013 to 2017, with 82 respondents taken using random sample techniques and 5% significance level.

This research model was adopted from the Theory of Planned Behavior model [10-16], where it was believed that the intention to behave could lead to behavior. Thus, understanding the factors that cause the intention to share knowledge can lead to knowledge sharing behavior. Referring to the
theory, the variables or factors that will be tested are 3 (three) independent variables, namely: Individual Personality (X1), Social Norms (X2), Rewards (X3); and 2 (two) dependent variables, namely Knowledge Sharing Intention (Y1) and Knowledge Sharing Behavior (Y2).

Furthermore, decomposing of these variables into influencing dimensions where every dimension was understood as a feature requirement; was prepared using expert advice by conducting interviews with psychologists. Each variable examined with the questions in the questionnaire study as closed questions, using Likert Scale models. All the questions in the questionnaire are statements that measure positive value.

**Table 1. Decomposition of variables into indicators and features needed**

| Variables            | Influencing Dimensions       | Features Needed         |
|----------------------|------------------------------|-------------------------|
| Individual Personality (X1) | Introvert (X11, X12)         | Texting Post            |
|                      | Extrovert (X15, X16)         | Photo Post              |
|                      | Confidence (X19, X110, X111, X112) | Menu / Category        |
|                      | Consequence (X116)           | Comments                |
| Social Norms (X2)    | Organizational Culture (X21, X22, X23, X24) | Forum / Discussion |
|                      | Leadership (X25, X26, X27, X28) | Share                   |
|                      | Intrinsic (X31, X32)         | Like                    |
| Rewards (X3)         | Financial (X33)              |                         |
|                      | Non Financial (X35, X36)      |                         |
| Sharing Intention (Y1) | Need To Help (Y12)           | Video Post              |
|                      | Self Actualization (Y16, Y17, Y18) | Timeline Show         |
|                      | Motivation (Y19, Y110, Y111) | Search                  |
| Sharing Behavior (Y2) | Tacit Knowledge Sharing Behavior (Y22, Y23, Y26) |                         |
|                      | Explicit Knowledge Sharing Behavior (Y27, Y29, Y211) |                         |
3. Results and discussion

Data were analyzed using Partial Least Square (PLS) type of Structural Equation Modeling (SEM) using SmartPLS software. Research with PLS-SEM uses two important stages, i.e. measurement model (measurement variable models) and structural model (measurement structures). Data on measurement model was used to evaluate the validity and reliability, while in a structural model of the hypothesis is tested through the significance of: 1) Path coefficient, 2) T-Statistic, and 3) r-squared value.

This validity test is intended to find out the extent to which the questionnaire question items arranged can represent the variables being measured. Testing the validity were using the loading factor from the calculation of SmartPLS software. An indicator was said valid when the loading factor is minimum equal to 0.50. The Outer loading is shown in table 2, where in items X1.3, X1.4, X1.7, X1.8, X1.13, X1.14, X1.15, X2.1, X2.2, X2.3, X2.4, X3.3, Y1.1, Y1.12, Y1.3, Y1.4, Y1.5, Y2.1, Y2.4, Y2.5, Y2.8, Y2.10, have the value of outer loading < 0.5 it must be eliminated or reduced. The final result of the validity test is listed in figure 2.

| Item | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | Standard Error (STERR) | T Statistics (|O/STERR|) |
|------|---------------------|----------------|---------------------------|------------------------|-----------------|
| X1.1 | 0.557786            | 0.546709       | 0.120291                  | 0.120291               | 4.636982        |
| X1.10| 0.595034            | 0.577961       | 0.118518                  | 0.118518               | 5.020619        |
| X1.11| 0.599178            | 0.567965       | 0.166887                  | 0.166887               | 3.590327        |
| X1.12| 0.714835            | 0.708417       | 0.096507                  | 0.096507               | 7.407073        |
| X1.13| 0.445825            | 0.426273       | 0.129985                  | 0.129985               | 3.429835        |
| X1.14| 0.442297            | 0.417465       | 0.148042                  | 0.148042               | 2.987646        |
| X1.15| 0.288498            | 0.301875       | 0.139153                  | 0.139153               | 2.073254        |
| X1.16| 0.538411            | 0.532485       | 0.144142                  | 0.144142               | 3.735275        |
| X1.17| 0.601221            | 0.577935       | 0.125779                  | 0.125779               | 4.779964        |
| X1.18| 0.446472            | 0.408888       | 0.16907                   | 0.16907                | 2.640754        |
| X1.19| 0.360501            | 0.348296       | 0.141743                  | 0.141743               | 2.543347        |
| X1.2 | 0.530398            | 0.52306        | 0.144731                  | 0.144731               | 3.664717        |
| X1.6 | 0.65211             | 0.638673       | 0.109317                  | 0.109317               | 5.965302        |
| X1.7 | 0.478948            | 0.456158       | 0.141007                  | 0.141007               | 3.396636        |
| X1.8 | 0.452387            | 0.446792       | 0.163682                  | 0.163682               | 2.763819        |
| X1.9 | 0.657244            | 0.629329       | 0.129668                  | 0.129668               | 5.068658        |
| X2.1 | 0.502365            | 0.494260       | 0.253181                  | 0.253181               | 0.99289         |
| X2.2 | 0.485811            | 0.457673       | 0.209234                  | 0.209234               | 2.321848        |
| X2.3 | 0.416813            | 0.39135        | 0.228823                  | 0.228823               | 1.821554        |
| X2.4 | 0.395775            | 0.376394       | 0.223084                  | 0.223084               | 1.774105        |
| X2.5 | 0.69612             | 0.660051       | 0.129547                  | 0.129547               | 5.373471        |
| X2.6 | 0.726455            | 0.678941       | 0.146663                  | 0.146663               | 4.953234        |
| X2.7 | 0.513158            | 0.497457       | 0.13258                   | 0.13258                | 3.870564        |
| X2.8 | 0.780508            | 0.775192       | 0.057947                  | 0.057947               | 13.469361       |
| X3.1 | 0.653483            | 0.636203       | 0.126124                  | 0.126124               | 5.181259        |
| X3.2 | 0.693531            | 0.636959       | 0.195231                  | 0.195231               | 3.552365        |
| X3.3 | 0.478233            | 0.486775       | 0.175508                  | 0.175508               | 2.724854        |
| X3.4 | 0.62769             | 0.584339       | 0.164631                  | 0.164631               | 3.812717        |
Reliability test is done by looking at the quality of the data on the composite reliability value and the average variance extracted generated by the calculation of Smart PLS software. The results of reliability test for all the studied variables are shown in Table 2 shows that all research variables have shown as a fit gauge, in general the studied variables of all question items that will be used have a good level of reliability.

Table 3. Reliability test

|      | AVE   | Composite Reliability |
|------|-------|-----------------------|
| X1   | 0.390316 | 0.850267              |
| X2   | 0.509282 | 0.802293              |
| X3   | 0.459541 | 0.808640              |
| Y1   | 0.510955 | 0.878352              |
| Y2   | 0.457853 | 0.833328              |
Inner model testing or structural model is done to see the relationship between variables from the research model as shown in Figure 2. Structural models were evaluated using R-square (coefficient of determination), the data shows that the Knowledge Sharing Intention variable has an R-square value of 0.588, while the R-value square variable Knowledge Sharing Behavior of 0.626. It can be seen that the structural relationship between variables in the form of path coefficients in this study, the structural equation is as follows:

\[ Y_1 = 0.465 \times X_1 + 0.260 \times X_2 + 0.170 \times X_3 \]  \hspace{1cm} (1)
\[ Y_2 = 0.465 \times X_1 + 0.206 \times X_2 + 0.170 \times X_3 + 0.445 \times Y_1 \]  \hspace{1cm} (2)

![Figure 2. Final structural model with path coefficients and loading factors after elimination of validity test](image)

Hypothesis tests based on the values found in the structural model analysis, the level of significance of the path obtained from the t-value, the standardized path coefficient value, the probability value (P) is used as a predictor of the significance of the relationship or influence between variables. Hypothesis testing value limit that is the t-value of the factor load (factor loadings) is greater than the critical value (≥1.98).

| Path                                      | Original Sample (O) | Sample Mean (M) | T Statistics | P-VALUE |
|-------------------------------------------|---------------------|-----------------|--------------|---------|
| Individual Personality (X1) -> Sharing Intention (Y1) | 0.465038            | 0.474761        | 3.310169     | 0.0015  |
| Individual Personality (X1) -> Sharing Behavior (Y2)    | -0.12824            | -0.0872         | 0.654566     | 0.5150  |
| Social Norms (X2) -> Sharing Intention (Y1)               | 0.260608            | 0.274464        | 1.911812     | 0.0601  |
| Social Norms (X2) -> Sharing Behavior (Y2)                | 0.206535            | 0.196603        | 1.457617     | 0.1495  |
| Rewards (X3) -> Sharing Intention (Y1)                   | 0.170446            | 0.159032        | 1.629152     | 0.1079  |
| Rewards (X3) -> Sharing Behavior (Y2)                    | 0.427909            | 0.401593        | 3.278912     | 0.0016  |
| Sharing Intention (Y1) -> Sharing Behavior (Y2)          | 0.445164            | 0.436757        | 3.421114     | 0.0011  |
Based on the calculations obtained structural coefficient value of 0.465 with t value (3.310) > t-table (1.98) and probability 0.001 < 0.05, then the hypothesis which states the influence of individual personality of AIESEC Unsri members on the intention to share knowledge can be accepted. Thus, from the four indicators measured in the Individual Personality (X1) variable, the results of the research show that individuals who have a personality have difficulty expressing feelings that are felt (introverted) require text features in sharing knowledge within the organization.

Then, individuals who are more daring to express feelings that are felt through self-image (extroverts) need photo features to share their knowledge and experience. And the belief indicator is the user's mindset towards the menu feature that these features can bring them to the knowledge they want to find. Consequently, a brave individual who understands the comments he writes on the comments feature will bring up different assumptions among other members so that the individual can accept the consequences because he will not dare someone to submit comments that do not match the facts. So that from the Individual Personality (X1), 4 features are needed in raising the intention to share knowledge in AIESEC Unsri, namely text features, photo features, menu / category features and comment features.

Based on the calculation results obtained structural coefficient value of 0.206 with t value (1.911) < t-table 1.98 and probability 0.06 > 0.05, then the hypothesis that there is an influence of social norms on the intention to share knowledge, is not acceptable. Thus, in AIESEC UNSRI there is no influence from the developing social norms that have no impact on the intention to share knowledge. Of the 2 indicators measured in the Social Norm (X2) variable there are those that must be reduced in the calculation because it has a value of <0.05 factor loading, that is Organizational Culture indicator (X21) of 1.774 so that it is considered not an indicator of the Social Norm variable, therefore the need for discussion forum features not needed in the proposed knowledge sharing system.

Meanwhile the instrument validity for valid indicators has a very high loading factor, leadership (X22) of 0.799 but in aggregate only has a very low influence on Knowledge Sharing Intention with a coefficient of 0.206. So that the share features proposed in leadership (X22) are still proposed, someone can get learning from the experiences that other individuals have with the sharing feature. So that these factors must be evaluated and reviewed, and further developed other factors in this Social Norm in order to support and influence Knowledge Sharing Intention.

Based on the calculation obtained structural coefficient value of 0.170 with t value (3.278) > t-table (1.98) and probability 0.001 < 0.05 then the hypothesis which states the effect of appreciation on the intention to share knowledge can be accepted. Thus, in AIESEC Unsri there is a significant influence rather than an appreciation of the intention to share knowledge. The better the award will impact the better the intention to share knowledge. On the contrary, the worse the award will impact the worse the intention to share knowledge.

The results of the research are in-line with the theory that sharing knowledge as a behavior that is in accordance with the Theory of Planned Behavior (TPB) requires a behavioral control, where a behavioral control is an award obtained from yourself, from other members and from the organization itself. Therefore, it takes a feature like to bring up the Knowledge Sharing Intent, with the needs of people who need high appreciation so they are happy with the many likes of the experience and knowledge shared.

Based on the calculation obtained structural coefficient value of 0.445 with t value (3.421) > t-table (1.98) and the probability 0.001 < 0.05 then the hypothesis that states the influence of intention to share knowledge on knowledge sharing behavior, can be accepted. Thus, there is a significant influence on the intention to share knowledge with knowledge sharing behavior. This significant influence prove that the hypothesis, where the better the intention to share knowledge than better the knowledge sharing behavior, vice versa.

From the results of the research Knowledge Sharing Intent is a good mediator on the relationship of Individual Personality, Social Norm and Award with Knowledge Sharing Behavior. Need to help, individuals who are eager to help others will provide their experience and knowledge through video features. Self-actualization, an individual who wishes to actualize himself by feeling proud if the
knowledge and experience he posted is on the timeline. Therefore, the timeline feature is needed. Motivation, the search feature makes individuals easier and more motivated to find the desired experience and knowledge. So, we got 3 features based on the Knowledge Sharing Intents variable, which are video features, timeline features and search features. The results of the study also show that Knowledge Sharing Intent is a good mediator of the relationship of Individual Personality, Social Norm and Award with Knowledge Sharing Behavior. In other words, the intention to share knowledge is a variable that can bridge Individual Personality, Social Norms and Awards towards Knowledge Sharing Behavior.

4. Conclusions
Based on the results of the research data analysis and discussion, we have demonstrated the implementation of Theory of Planned Behavior in identifying User Requirements for the Knowledge Sharing System (Case Study: AIESEC Sriwijaya University). This study can draw the following conclusions:

1. As a system developer, to bring out the intentions and attitudes of individuals in knowledge sharing behavior must understand and know the individual's own personality. This is because individual personality factors have the highest level of influence to create intentions and attitudes in shaping knowledge sharing behavior.
2. For the AIESEC organization of Sriwijaya University to increase knowledge sharing behavior there are some factors those influence such as individual personality factors, social norms and rewards.
3. The researcher was able to identify 9 features needed by the user to generate intentions and attitudes in knowledge sharing behavior, therefore the Knowledge Sharing System (KSS) proposed as a medium of sharing between members of AIESEC Unsri is available Video features, Photos, Texts, Comments, Share, Like, Search, Menu / Categories and Timeline Features.

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