*International Journal of Engineering & Technology*, 7 (4.40) (2018) 15-20

**International Journal of Engineering & Technology**

*Website: www.sciencepubco.com/index.php/IJET*

***Research paper***

# Acceptance Model of Web 2.0 Technology in self-learning: the perspective of TOE and STS

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**Abstract**

The development of web 2.0 technology has an impact on the communication and collaboration processes carried out by its users. The use of social technology in the formal organizational environment and for formal needs is influenced by several factors. The TOE and STS aspects are used to understand the use of this technology for formal learning purposes that are carried out independently or self-learning. The TOE aspect is used to analyze technology components in relation to the organization and environment that uses it. The STS aspect is used to see the suitability of the technology to the task and its users including from the social side. Acceptance of social technology attached to web 2.0 technology by students by utilizing for the learning process need to be analyzed. The use of social media for the self-learning process shows that perceived behavior control does not significantly affect the intention of its users. User intention on social media in the self-learning process is influenced by the attitude and subjective norms of its users. The social influence brought by web 2.0 technology influences the subjective norms of its users.

***Keywords***: *Technology web2.0, self-learning, TOE, STS*

## 1. Introduction

One of the technologies that is very rapidly developing and widely used is web 2.0 technology. This technology is a technology in the form of web-based software, which allows people to be able to share information and collaborate through the internet [1]. Examples of existing web 2.0 technologies such as blogs, social media and YouTube. Web 2.0 technology (web as communication) which is often referred to as web technology for communication, is web development from web 1.0 (web as content). The ability of web 2.0 technology to build communities that can share and collaborate can be used for learning purposes.

Learning that is the target of one's self-learning process. Self-learning is one form of learning that develops due to the availability of online learning resources. In the independent learning process, one can determine what is to be learned, when is the time to learn how to learn is to be done. Web 2.0 technology is chosen because it is a technology that is widely used.

This technology offers a shift in the way people use the web [2, 3]. Web 2.0-based technology developed from web 1.0 is one technology that offers the ability for users to share information and collaborate through the internet. The presence of web 2.0-based information technology has developed into a basic need in achieving competitive advantage both personally and in groups. Competitive advantage is fostered because it will be very necessary to survive and be able to compete with other competitors [4, 5].

Web 2.0 focuses on the involvement of different users which then becomes the basis for developing web 3.0 is web as context. The use of this technology will succeed and bring targeted benefits if it has been accepted and adopted by its users. The use of web 2.0-based internet technology in an educational environment involves three components. The first component is the educational environment that will use. Use at the level of students who are not yet independent in the learning process will affect the benefits being targeted. The personal of these students is the second component that needs to be analyzed for its role. The third component relates to the technology chosen for use. Understanding these three components that play a role in the use of social-based web technology is something that needs to be studied.

Acceptance of technology can encourage the user's intention to use and continue to use. The acceptance analysis in this study takes the viewpoint of Technology Organization Environment (TOE) to cover environmental aspects of use and technology. The Socio Technical System point of view is used in the analysis to link web 2.0 technology and the technology user components.

Specific analysis is carried out on the acceptance and use of web 2.0 technology especially blogs, social media and YouTube in the learning process in higher education. This paper collects in several parts. The introduction will be presented in the first part, followed by the study of the TOE and STS theory in the context of using web 2.0. In the third part, methodology and hypothesis are described. The results and discussion in section 4 and then the last section concludes with a conclusion.

## 2. Study Literature

In this section we will explain the concepts and theories related to analysis and model building.

### 2.1. Technology Organization Environment

Adoption of technological innovation can be described as a sequence of three stages of initiation, adoption, and implementation [6]. The initial stages relate to the activities of collecting and eval-

uating matters relating to information technology. The second stage is the decision stage to use and adopt information technology. After the decision regarding information technology has been determined, the next step enters the stage of adopting the new technology chosen in the appropriate business process [7]. The success of information technology adoption is influenced by cultural factors [8], for example the leadership of organizations and the environment in small businesses has a role in making decisions about the use and adoption of information technology [9].

Organizational-oriented technology adoption framework abbreviated TOE (Technology Organizational Environment). The TOE framework identifies three aspects that influence the process of adopting and implementing technological innovations. These three aspects are technological aspects, organizational aspects, and environmental aspects. Technology aspects include internal and external technologies that are relevant to the company. This includes the role of technology that exists internally for the company and a set of technologies that are available externally outside the company. Organizational aspects refer to descriptive assessments of the organization such as scope / scope of business, size, and managerial structure. Environmental aspects include the arena in which the organization conducts its business, the area of industry groups, the scope of business competitors, and matters related to government regulation [10]. The TOE framework is illustrated in Figure 1 below:

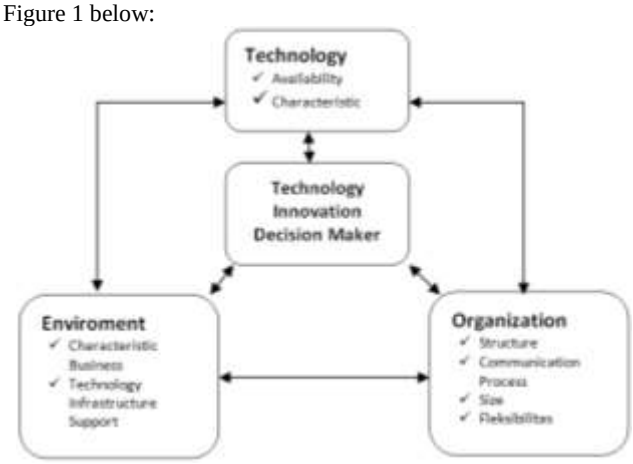


**Fig. 1:** TOE Framework [10]

## 2.2. Technology Acceptance Model

The Technology Acceptance Model (TAM) proposed by [11] is a popular model for identifying someone who can accept a new technology. The goal of TAM is more specifically to explain the behavior of computer users (computer usage behavior). TAM provides external variables on internal variables such as attitude, intention and so on [12]. TAM was developed based on the Theory of Reasoned Action (TRA) [13] in the field of social psychology. TRA explains a person's behavior through their intention (intention). Intention is determined by two things, namely individual attitudes in behavior and social norms that are used and understood by someone. The TRA model explains human behavior in general while TAM specifically describes information technology acceptance.

TAM is based on various information systems knowledge that already exists and in accordance with the computer acceptance model. In the TAM model it is explained that a person's intention to use a system or technology is determined by two factors, namely perceived usefulness and perceived ease of use. Perception of perceived usefulness is the level of individual trust that the use of technology will improve its performance. Perceived ease of use (perceived ease of use) is the level of individual trust that the use of technology makes it easier to complete work and free from effort in using it [14]. In TAM uses five (5) aspects in conducting the analysis[11], namely:

1. Perceived ease of use defined as the extent to which a person believes that the use of a technology will be free from business.
2. Perceived usefulness defined as the extent to which a person believes that the use of a technology will improve its performance.
3. Attitudes toward the use of technology defined as an evaluation of a person or user about his interest in using technology.
4. Interest in technology use behavior (behavioral intention to use), defined as the interest or desire of a person to perform certain behaviors.
5. Use of real technology (actual technology usage), measured by the amount of time used to interact with technology and the frequency of use of the technology.

The TAM model has undergone many improvements in several studies, especially related to the compatibility with the context of the technology used. One of the important and accepted improvements is the inclusion of elements of social influence in predicting the use of new technology by users [14]. An. important and well received revision from TAM has included the process of social influence in predicting the use of new technology by its users.

## 2.3. Socio-Technical System

The term socio technical system was discovered by Emery and Trist in 1960. This system involves complex relationships between human, machine and environmental aspects in existing work systems [15]. Bostrom and Heinen describe general organizational work systems as consisting of social subsystems and technical subsystems [16]. Socio technical systems are a method for understanding how human, social and organizational factors influence the way work is done and how technical systems (technology) are used [17]. Understanding these factors can contribute to the design of organizational structures, business processes and technical systems or technological development. The social subsystem consists of structure and people, and the technical subsystem consists of technology and tasks as in Figure 2.

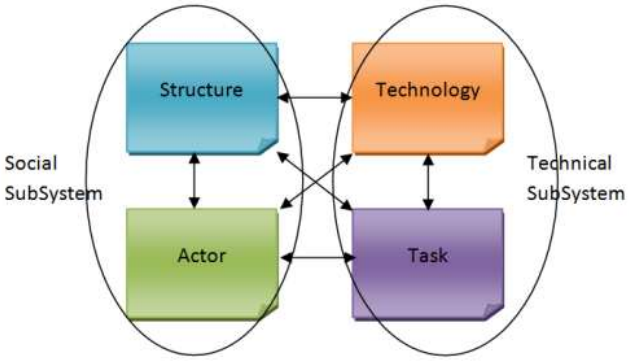


**Fig. 2:** Socio Technical System

Bostrom and Heinen explained that the management information system (MIS) has a direct effect on the technical subsystem component. Some problems with the failure of the application and use of technology and information systems often stem from organizational behavior problems involving social subsystem components [18].

The interaction of these two subsystems can be described as the relationship between the two components that results in six separate relationships (actors, actors, actors, technology, tasks, technology, tasks, and technology structures). Further definition of social subsystems also considers the attributes of actors which include attitudes, skills, and values, and the relationship between actors and the structure of authority needed. Further understanding of this social interaction can be drawn from other definitions of structure. Giddens describes the structure by giving shape and picture to social life which refers to the internal understanding of human rules involved in external actions [19]. The structure can also be seen as the emergence of recursive interactions between

technology and humans [20]. There are interactions that are understood between entities in each of these descriptions. Consideration of this view lends to the focus of this study to study the interactive relationships between components of the socio-technical system. The current socio-technical system concept has been widely used to describe many complex systems, but there are 5 characteristics of open socio-technical systems [21]:

1. The system must have interdependent parts.
2. The system must adapt and desire to achieve goals in the external environment.
3. The system has an internal environment consisting of separate but interdependent technical and social subsystems.
4. The system has equifinality, in other words, the purpose of the system can be achieved in more than one way. This means that there are design choices that will be made during system development.
5. System performance depends on joint optimization of technical and social subsystems. Focusing on one of these systems and putting aside others, it is likely to cause poor system performance and use.

The definition of the socio-technical component and the relationships that occur between its components are described in Table 1 below:

**Table 1:** Socio-Technical Component and the Relationships

| Socio Technical Component | Definition |
|---|---|
| Actor | Actors include members of organizations and key stakeholders who carry out or influence work. |
| Structure | Structure includes communication systems, authority systems, and workflow systems. This includes normative dimensions, values, norms, and generally expected roles, and behavioral dimensions, behavioral patterns carried out by actors in communicating, exercising authority or working |
| Task | The task of explaining the purpose and purpose of the system work and the steps of how a job is carried out in the organization |
| Technology | Technology tools used in work systems |
| Relation of Component | Description |
| Actor-Structure | Actors follow operating procedures, the structure supports actors in their tasks. |
| Actor-Task | Actors understand and carry out tasks, actors are trained to do tasks. |
| Actor-Technology | Actors understand and accept technology, actors adopt technology for their environment. |
| Task-Technology | The right technology is chosen and sufficient to support tasks. |
| Task-Structure | The structure is aligned with the task, an adequate structure is defined for tasks |
| Technology-structure | Technology is adapted and modified to be given structure, structure takes advantage of technological capabilities |

## 3. Research Methodology

The use of new technology or systems by its users will succeed if the new technology or system is acceptable. The acceptance model of TPA, TAM, TOE and STS is used as a reference to get the role and impact of the changes being targeted. Self-learning is a new form of learning that complements a person in getting the knowledge or skills they need. A person's discipline is the reason for the success of self-learning that is carried out. The use of technology, especially internet technology, is one of the supporting processes for the independent learning process [22]. The successful use of self-supporting learning technology can be seen from the TOE aspect consisting of technology, organization, and environment. Technology relates to the type of technology that can be used in the learning process independently [23].

The web 2.0 technology is chosen as a technology that is capable of encouraging and motivating independent learning behavior by its users. Web 2.0 technology which is a social technology is able to build user involvement. Users can share material or easily search for the materials needed for independent learning they do. YouTube technology, one of the web 2.0 technologies, is able to help users through tutorial videos or percentages shared between users.

The second aspect of TOE is an organization that includes governance of the use of technology that can be permitted in the learning process in general. The governance of the use of web 2.0 technology is not clearly regulated. The use of web 2.0 technology in the independent learning process is not formally regulated which makes this technology not so quickly used in the learning process. The use in a group or limited organizational scope such as discussion groups will greatly help the process of self-learning carried out. Environmental aspects relate to the user environment itself included related to the ability to access web 2.0 technology to the environment or group where the user is located or joining.

The STS aspects that are analyzed and become the basis for developing the acceptance model of web 2.0 technology in the independent learning process include users as actors, governance, assigned tasks and technology. This aspect of STS intersects with the TOE aspect in terms of organization and technology. These two aspects have been described in the previous paragraph. The actor or user aspect needs to be seen as being interested in technology with TAM that focuses more on personal acceptance of technology users. In individual acceptance, it is known that user interest is valued from aspects of perceived ease of use and perceived useful

The perspective used to test the acceptance of persuasive technology is outlined below:

The ease of use perspective (perceived ease of use) is used to express the user's belief that a technology that is used or applied can be easily understood and understood [24]. This level of confidence makes the technology not a burden for its users. The level of confidence in the ease of use of the technology used can be demonstrated through the level of use and interaction that is carried out by users of the technology. The level of use and interaction between users and technology is also able to demonstrate ease of use. More commonly used technology illustrates that the technology is easier to understand, better known, easier to operate and easier to use by its users. Perceived ease of use is the level of the user's personal trust that the use of technology makes it easier to complete work [14]. The level of user convenience towards a technology will depend on the level of user confidence that the technology and system provided can be easily understood, executed and used. This level is assessed by indicators that question the level of ease of use, ease of learning if it is a new technology to the ease of being able to become skilled in using it.

*Hypothesis 1:* Perceived ease of use positively affects attitudes towards usage of Web 2.0 in self-learning.

Perceived usefulness is the level of how far one will believe that the use of certain technology and information systems will improve its performance [24]. The perceived usefulness is a form of the value of the user's trust about the decision-making process he does on something, where this decision shows that if someone feels confident that the technology or system is useful then the person will use it [25]. Conversely, if someone believes that information technology or systems are useless or less useful, then someone will not use them. This concept also illustrates the benefits of technology for its users related to improving productivity, helping to make work easier, improving task performance or effectiveness, the level of importance of technology for the completion of work / tasks, and overall usefulness or overall usefulness. The possibility of the benefits taken can be used as an indicator of the level of use of technology or systems used.

*Hypothesis 2:* Perceived usefulness positively affects attitudes towards usage of Web 2.0 in self-learning.

Attitude toward behavior is the evaluation of users both positively and negatively towards the use of a technology or system [26]. Attitudes can be expressed as internal conditions that affect the actions of individuals towards an object, in other individuals or in

certain events [27], and include conditions on the use of new technology. Attitude is a personal factor that contains a positive evaluation of behavior that avoids, opposes, or blocks objects [28].

*Hypothesis 3:* Attitude of users towards using Web 2.0 positively affects behavioral intentions.

Social influence is the impact of the relationship of people with other people or society in general resulting in changes in behavior both intentional and unintentional [26, 29]. There are three types of social influence, namely conformity, compliance, and obedience [30]. The use of new technologies and systems can occur due to the role of external parties or partners. Social influence can occur when emotions, opinions, or individual behavior are influenced by other individuals. Some social influences can occur, among others, in the form of conformity, socialization, peer pressure or boss, obedience, leadership, persuasion, and encouragement as in the case of sales or marketing.

*Hypothesis 4:* Social influence to uses web 2.0 in self-learning positively affects subjective norm.

Subjective norms are perceived social pressure to do or not to conduct a behavior [27]. Subjective norms are also measured as normative beliefs without including motivation to obey something that is the target [26]. Subjective norms can be reviewed by estimating a person against the social pressure he receives to do or not to conduct the target behavior. Subjective norms in normative belief assess the user's belief that other people related to the user want the user to believe and do it. Examples in the learning process where the teacher related to students want students to believe in e-learning technology that will be used and want students to participate using it in the learning process. Evaluation of subjective norms can be positive or negative for what will be believed or will be done.

*Hypothesis 5:* Subjective norm of users towards using Web 2.0 in self-learning positively affects behavioral intentions.

Self-efficacy is an individual's belief in the ability that exists for him to do something [31, 32] [29, 30]. The level of self-efficacy of each individual can play a major role in how the individual achieves his goals, tasks, and faces the challenges.

*Hypothesis 6:* Self-efficacy of users towards using Web 2.0 in self-learning positively affects perceived behavior control.

Perceived behavior control is a person's ability to control an event or situation, a particular subject, technology or other conditions [27]. This situation is related to controlling internal conditions and beliefs to influence someone or their environment. Individuals with perceived high control usually have high motivation and try to achieve their goals. Another characteristic is to have the potential and ability to overcome a situation. On the contrary, there are individuals with low perceived control who tend to be more passive and antipathy.

*Hypothesis 7:* Perceived behavior control of users towards using Web 2.0 in self-learning positively affects behavioral intentions

Behavioral intention is one's tendency towards the behavior to be addressed [24, 25]. The intended behavior in this study is the use of new technology in the learning process. Behavioral intention is a form of willingness from users who tend to pay attention or feel happy so that they are more willing to use the technology used to achieve their goals. Although there is no definite relationship between behavioral intentions and actual user behavior, intention can be used as an approach in an attempt to conduct behavioral measurements. This variable can also be used to assess the effectiveness of an implementation if there is no available size to measure actual behavior.

*Hypothesis 8:* Attitude toward behavior of users towards using Web 2.0 positively affects behavioral intentions in self-learning.

Testing the use of web 2.0 technology is carried out in the self-learning process. Tests are carried out using survey methods and questionnaires. The survey method is suitable for use in testing the research hypothesis, descriptive, comparative and associative hypotheses. Web 2.0 technology tested is limited to Blog technology, especially social media, facebook and video sharing, especially YouTube. The test does not separate or classify the use of other web 2.0-based technologies. Users are directed to be able to link and use blogs and social media for the self-learning process they do.

The test was conducted by giving questionnaires online and offline to 250 students randomly with an educational background in the study program with information technology background at a private university. Returned and valid questionnaires were 172 people or 68.8% of the total questionnaires. The total respondents consisted of 69 men and 103 women. These respondents have used web 2.0 technology (Blog, Facebook, YouTube) anywhere or mobile as many as 127 respondents and besides doing it at home, internet cafe or campus environment. The analysis carried out does not pay attention to the gender differences or the user's study period.

## 4. Result and Discussion

The initial inner model and indicators are illustrated in the model. The results of data processing for the PLS Algorithm method with a minimum of 300 iterations performed using SMART-PLS 2 software can be obtained.

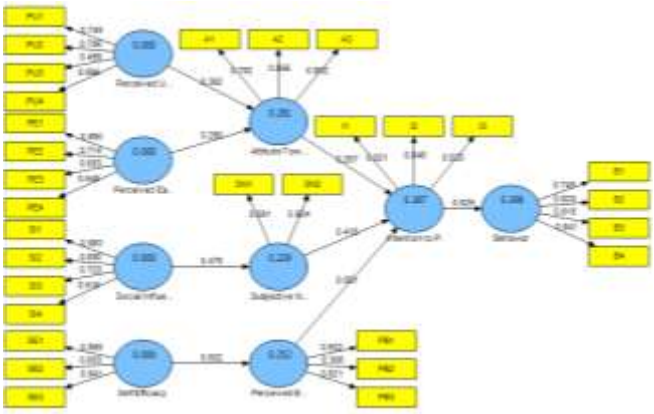

**Fig. 3:** PLS Algorithm Processing

Outer model or measurement model is analyzed by convergent validity value, discriminant validity, and composite reliability. Converging validity is analyzed with the outer loading value of each indicator for all constructs. The outer loading value for some indicators does not meet minimum the value or less than 0.70 so that must be discarded. Processing results after removing the indicator which is less than 0.70 can be seen in Figure 4. An indicator greater than 0.70 indicates that the reflective indicator used is valid.

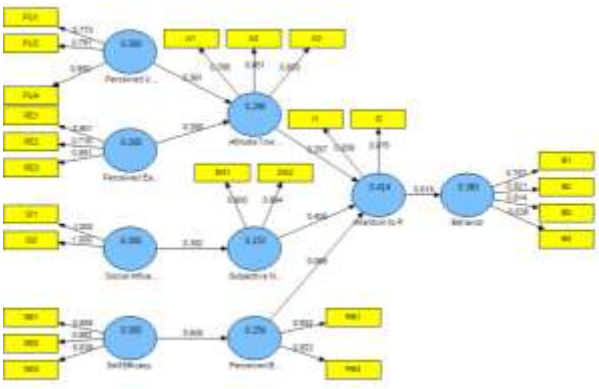

**Fig. 4:** PLS Algorithm with a valid indicator

The indicators in Figure 4 have fulfilled a value greater than 0.7 so that it can show that the reflective indicator used is valid.

**Table 2:** AVE with valid indicator

| Construct | AVE | AVE Square |
|---|---|---|
| Perceived Useful | 0.648408 | 0.805238 |
| Perceived Ease Of Use | 0.705810 | 0.840125 |

| | | |
|---|---|---|
| Attitude Toward to Behavior | 0.662197 | 0.813755 |
| Social Influence | 1,000000 | 1.000000 |
| Subjective Norm | 0.805058 | 0.897250 |
| Self Efficacy | 0.756772 | 0.869926 |
| Perceived Behavior Control | 0.859039 | 0 926844 |
| Intention to Perform Behavior | 0.735887 | 0.857839 |
| Behavior | 0.651544 | 0.807183 |

Based on Table 3, it can be seen that the composite reliability value is above 0.70, or ideally 0.8-0.9. Cronbach's alpha result for the Intention construct is only 0.642201 or less than 0.70 and cronbach's alpha result for the Social Influence construct is 1, indicating the non-reliability of the construct. This shows that every construct except Intention already has good reliability.

**Table 3:** Latent Variable Corelation with Indicator

| | Attitude Toward to Behavior | Behavior | Intention to Perform Behavior | Perceived Behavior Control | Perceived Ease Of Use | Perceived Useful | Self Efficacy | Social Influence | Subjective Norm |
|---|---|---|---|---|---|---|---|---|---|
| Attitude Toward to Behavior | 1.000000 | | | | | | | | |
| Behavior | 0.575412 | 1.000000 | | | | | | | |
| Intention to Perform Behavior | 0.534707 | 0.618603 | 1.000000 | | | | | | |
| Perceived Behavior Control | 0.314539 | 0.335634 | 0.285084 | 1.000000 | | | | | |
| Perceived Ease Of Use | 0.440935 | 0.388997 | 0.429752 | 0.554027 | 1.000000 | | | | |
| Perceived Useful | 0.492142 | 0.360653 | 0.398154 | 0.288100 | 0.513048 | 1.000000 | | | |
| Self Efficacy | 0.495997 | 0.496197 | 0.597166 | 0.505763 | 0.537510 | 0.357761 | 1.000000 | | |
| Social Influence | 0.440848 | 0.295685 | 0.401076 | 0.231323 | 0.287370 | 0.499904 | 0.325678 | 1.000000 | |
| Subjective Norm | 0.537670 | 0.564831 | 0.584458 | 0.312975 | 0.406229 | 0.381016 | 0.562636 | 0.391521 | 1.000000 |

**Table 4:** Composite Reliability and Cronbach's Alpha use of Web 2.0

| **Construct** | **Composite Reliability** | **Cronbach's alpha** |
|---|---|---|
| Perceived Useful | 0.846709 | 0.739624 |
| Perceived Ease Of Use | 0.876892 | 0.792244 |
| Attitude Toward to Behavior | 0.854526 | 0.744379 |
| Social Influence | 1.000000 | 1.000000 |
| Subjective Norm | 0.892001 | 0.757892 |
| Self Efficacy | 0.903179 | 0.839437 |
| Perceived Behavior Control | 0.924173 | 0.836073 |
| Intention to Perform Behavior | 0.847793 | 0.642201 |
| Behavior | 0.881900 | 0.822338 |

Inner model or structure model can be evaluated by considering R-square values, path coefficient, and t-values. R-square and path coefficient are obtained through the PLS algorithm, while the t-value is generated from the bootstrapping process. Bootstrapping processing with samples up to 500 is shown in Figure 5.

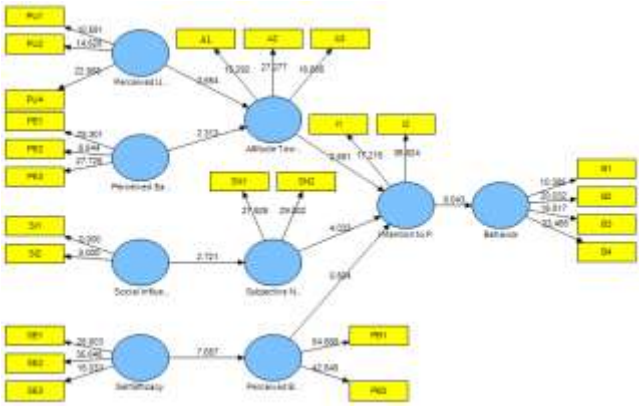

**Fig. 5 :** Bootstrapping Process

As previously stated, the interpretation of R-square values is the same as the regression interpretation in general. This value indicates the goodness fit of variable and how much the independent variable can describe the dependent variable. The value of the R-square can be seen in Table 5.

**Table 5:** R-Square

| **Construct** | **R Square** |
|---|---|
| Attitude Toward to Behavior | 0.290401 |
| Behavior | 0.382669 |
| Intention to Perform Behavior | 0.413659 |
| Perceived Behavior Control | 0.255796 |
| Subjective Norm | 0.153288 |

**Table 6 :** Path Coefficient , p-value and t-value

| **Path** | **Path Coefficient** | **t-value** | **p-value** | **T-table** α =0,05 df=171 | **Decision** |
|---|---|---|---|---|---|
| Attitude Toward to Behavior →Intention to Perform Behavior | 0.2967 | 2.8176 | 0.0054 | 1.6583 | Significant |
| Intention to Perform Behavior → Behavior | 0.6186 | 9.0671 | 0.0000 | | Significant |
| Perceived Behavior Control → Intention to Perform Behavior | 0.0651 | 0.7575 | 0.4497 | | No Significant |
| Perceived Ease of Use → Attitude Toward to Behavior | 0.2557 | 2.3544 | 0.0197 | | Significant |
| Perceived Useful →Attitude Toward to Behavior | 0.3609 | 3.6892 | 0.0003 | | Significant |
| Self Efficacy →Perceived Behavior Control | 0.5057 | 7.3854 | 0.0000 | | Significant |
| Social Influence →Subjective Norm | 0.3915 | 2.8356 | 0.0051 | | Significant |
| Subjective Norm → Intention to Perform Behavior | 0.4045 | 3.9393 | 0.0001 | | Significant |

The result of coefficient and t-value paths is used to evaluate the structure model and can also be used to test the proposed hypothesis. Path coefficient in the form of positive or negative values is used to test whether or not there is a relationship between two variables as proposed in the hypothesis. Meanwhile, t-value is used to test the level of significance of the relationship shown in the path coefficients. Path-coefficient, t-value, and t-table values with a significance value of 0.05 can be seen in Table 5.

The data illustrates that the H7 hypothesis: Perceived Behavior Control will have a positive influence on the Intention to Perform Behavior which is unacceptable, this is because the t-value is smaller than the t-table for a significance value of 0.05. Perception of the use of web 2.0 technology does not have a positive influence on user attitudes and does not relate the Perceived Behavior contract with Intention. Testing other proposed hypotheses can be accepted because the t-value is higher than the t-table and the p-value is greater than 0.05.

Path coefficient and t value values in Table 6 are used to analysis structural models in general. This value is also used to test the proposed hypothesis. Path coefficient values can be positive or negative will be used to test the relationship between two variables proposed in the hypothesis. The value of t-value will be used to test the level of significance of the relationship shown in the path coefficients. Path coefficient, t-value, and t-table values with a significance value of 0.05.

## 5. Conclusion

The acceptance model of web 2.0 technology, especially social media in the process of self-learning is influenced by individual and organizational acceptance. Web 2.0 technology used needs to be seen in accordance with the environment and user organization. Use in a self-learning environment by students in higher education is possible because it is in line with the high level of learning independence. Perceived behavior control is not significant in influencing user intention compared to attitude and subjective norm. The social influence that appears also shows the influence on the subjective norms of its users. Comparison of educational subjects can be used as further studies.

## Acknowledgement

This research was funded by the Research and Technology Ministry in the DRPM grant program for doctoral programs.

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