A Conceptual Model of E-Government Adoption in Indonesia

Darmawan Napitupulu [#]

[#] *Indonesian Institute of Sciences, Puspiptek Serpong, South Tangerang, 15314, Banten, Indonesia*
E-mail: darwan.na70@gmail.com

***Abstract*— This study aims to determine various factors are related with the process of e-Government adoption. Many researchers have traced the success factors of e-Government but are still partial. This research contributes not only in terms of technological factors but also the attitudes and behaviours of its users (personality traits) which is also influential in the process of technology adoption. In this research, will be developed an adoption model of technology in the context of e-Government. This model incorporates some best practices related to the diffusion of technology such as TRI, TAM, UTAUT, IS/IT Success Model, as well as other factors influencing the adoption of e-Government such as Trust and Compatibility based on previous research. The conceptual model proposed could bring better understanding about important issues especially in e-Government adoption process in Indonesia.**

***Keywords*— Adoption, User, E-Government, Conceptual, Model, Indonesia.**

I. INTRODUCTION

E-Government has emerged as a key technology and developed nations have adopted it to better serve their citizens through efficient and effective services, with accountability and transparency. E-Government is a strategic application of ICT used by a government to create an environment which is comfortable, transparent and less costly for interacting with citizens and business [1]. It involves new styles of leadership, new ways of debating and deciding policy and investment, new ways of accessing education, new ways of listening to citizens and new ways of organising and delivering information and services [2].

E-Government is not only about the application of technology to manage government functions electronically and provide easy access to government services to the citizens [3]. It is a socio-technical system that depends on people, process, technology and resources. E-Government became a relevant term after the ICT boom in different parts of the world and many governments took it as a tool to simplify their functions [3].

The United Nations e-Government reports indicated that in regional ranking, Asia is lagging from other regional such America and Europe in adopting e-Government services around the world [4]. United Nations (2014) found that the average score was 0.4712 reported as world median for a regional ranking score. Meanwhile, Europe (0.6936) continues to lead with the highest regional United Nations e-Government reports, followed by the Americas (0.5074), Asia (0.4951), Oceania (0.4086) and finally Africa (0.2661). The report has revealed that e-Government service in Asia is lacking in term of implementation and citizen's intention to use e-Government system [5].

Heeks has been revealed that 35% of e-Government projects in developing countries including Indonesia are total failures, 50% are partial failures, while the remaining only 15% were succeeded [6]. Similarly, Gartner also states that more than 60% of all e-Government initiatives fail or are far from desired expectations [7]. In 2003, UNDESA (United Nations Department of Economics and Social Affairs) reported that the failure rate of e-Government project failures in developing countries is around 60-80% [8]. Standish Group reported a decline in success rate, only 32% of ICT projects are said to be successful on time, on cost and functional [9]. A total of 44% of projects experience delays, over cost and do not meet specified specifications and functions while 24% of projects fail and are never used. If further examined, the speed of e-Government adoption varies between countries and other countries where developing countries including Indonesia are far behind when compared to developed countries. Based on e-Government readiness ranking 2014, Indonesia is ranked 110 deep below Vietnam, Philippines, Thailand let alone Malaysia and Singapore [4]. This shows that Indonesia is lagging behind e-Government adoption where its low utilisation and the high failure rate is due to the lack of ICT infrastructure, the low quality of human resources, the various cultural factors that generally occur in developing countries [10].

The adoption of the e-Government system is a relatively new area of research in the field of information systems, and there has not been much literature review to be found in

journals or conferences [11]. Sometimes it is not even differentiated between e-Government adoption and Internet adoption where they are different subjects in the information system literature.

Based on Roger, adoption or diffusion of technology is the process by which an innovation is communicated through certain channels over time among the members of a social system [12]. According to figure 1 showed diffusion process of technology that when the number of individuals adopting a new idea is plotted on a cumulative frequency basis over time, the resulting distribution is an s-shaped curve. At first, only a few individuals adopt the innovation in each time period (such as a year or a month, for example); these are the innovators. But soon the diffusion curve begins to climb, as more and more individuals adopt.

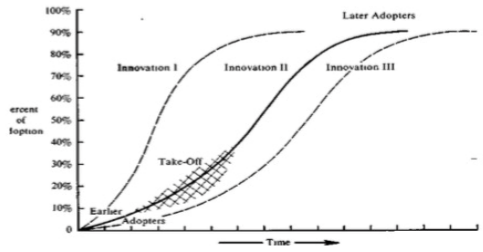

Fig. 1 Diffusion process of technology [12]

The trajectory of the rate of adoption begins to level off, as fewer and fewer individuals remain who have not yet adopted. Finally, the S-shaped curve reaches its asymptote, and the diffusion process is finished. Most innovations have an S-shaped rate of adoption. But there is variation in the slope of the "S" from innovation to innovation; some new ideas diffuse relatively rapidly and the s-curve is quite steep. Another innovation may have a slower rate of adoption, and its s-curve will be more gradual, with a slope that is relatively lazy. One issue addressed by diffusion research is why some innovations have a rapid rate of adoption, and why others are adopted more slowly. Further, the same innovation may be desirable for one adopter in one situation but undesirable for another potential adopter in a different situation.

It is therefore very important to know what factors are driving or influencing users to adopt a technological innovation. By knowing these factors then it can be predicted or explained the attitude and user behaviour in adopting the technology, especially in the context of e-Government in Indonesia. In this research will be developed a conceptual model of adoption of e-Government system in Indonesia that can identify various factors related to the user response to e-Government. This model is also expected to be used as an evaluation of ICT adoption process, especially in government institutions.

II. MATERIALS AND METHODS

A. Stages Model of Diffusion

The diffusion process is the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision [12].

This process consists essentially of dealing with the uncertainty that is inherently involved in deciding about a new alternative to those previously in existence. It is the perceived newness of the innovation, and the uncertainty associated with this newness, that is a distinctive aspect of innovation decision making (compared to other types of decision making).

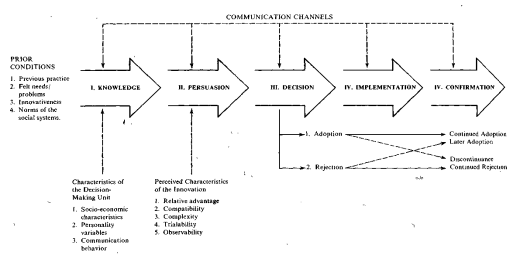

Fig. 2 Stage model of diffusion [12]

According to figure 2, there are five stages of diffusion process:

1. Knowledge occurs when an individual (or other decision-making unit) is exposed to the innovation's existence and gains some understanding of how it functions.
2. Persuasion occurs when an individual (or other decision-making unit) forms a favourable or unfavourable attitude toward the innovation.
3. Decision occurs when an individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation.
4. Implementation occurs when an individual (or other decision-making unit) puts an innovation into use.
5. Confirmation occurs when an individual (or other decision-making unit) seeks reinforcement of an innovation-decision already made, but they may reverse this previous decision if exposed to conflicting messages about the innovation.

The Roger's five stage model of diffusion is similar to diffusion model proposed by Iowa State University of Science & Technology (1981). Diffusion process by which people accept new ideas is not a unit act, but rather a series of complex unit acts called a mental process. They indicate that this mental process also consists of five stages [13]:

1. The awareness stage. At this stage, an individual becomes aware of some new ideas. They know about the existence of the idea, but they lack details concerning it.
2. The interest stage. At this stage, an individual wants more information about the idea or product. They want to know what it is, how it works and what its potentialities are that might help or improve their live.
3. The evaluation stage. At this stage, an individual makes a mental trial of the idea. They applied the information obtained in the previous stage to their own situation such as will the technology can do better than what they are doing now in order to increase income or improve any value.
4. The trial stage. At this stage, an individual tries the idea in small scale experimental use.
5. The adoption stage. At this stage, an individual adopts the technology in large scale, continued use of the idea and most of all, by satisfaction with the idea.

Then important point that the state of the diffusion process is the mental process of accepting new ideas and practices. Individuals may go through these stages at different rates. The complexity of the idea seems to be a major factor in determining the rate and manner of people.

B. Stages Model of Diffusion

Irani classified research paradigms in Information Systems into two paradigms, behavioural science and design science [14]. The design science leads to create artefacts to provide solutions for business problems, whereas the behavioural science seeks to develop and justify theories explaining or predicting organisational and human behaviour [14].

Based on that, the present study can be classified under the behavioural science paradigm. Hakim reported that to know deeply about the respond of users through existing Information System, then the behavioural theory used to evaluate the system implemented [15].

There are some behavioural theory or model that widely used to measure adoption process of information system/information technology (IS/IT) such as TRI (Technology Acceptance Model), TAM (Technology Acceptance Model), UTAUT (The Unified Theory of Acceptance and Use of Technology) and IS/IT Success Model Delon & McLean.

Technology readiness, defined by Parasuraman as "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work is a promising concept that actually helps both academics and managers understand the distinctive behavioural process behind the adoption of technology-based products and services [16][17]. According to Parasuraman, individual readiness is a significant factor that affects user adoption to the new technologies [16].

TRI measures an individual's readiness to use new technology, in general, using four personality traits: optimism, innovativeness, discomfort, and insecurity as explained below:

- Optimism: a positive view of technology. Belief in increased control, flexibility, and efficiency in life due to technology.
- Innovativeness: a tendency to be the first using new technologies.
- Discomfort: having a need for control and a sense of being overwhelmed.
- Insecurity: distrusting technology for security and privacy reasons.

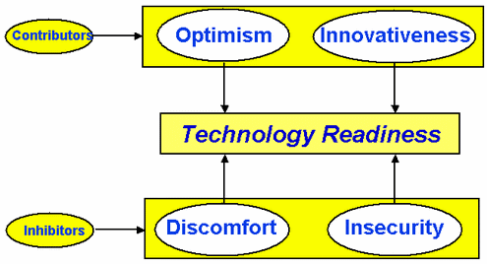

Fig. 3 Technology readiness index model [16]

Fig 3 above showed that the relative strength of each trait indicates a person's openness to technology. TRI thus reflects a set of beliefs about technology but is not an indicator of a person's competence in using it. Based on TRI, the individual's overall belief about technology could be theorised which also indicate their usage of technology-based product and services [16]. However, in fact, high TR users do not always adopt new technology [18][19]. So TRI model could not satisfactorily explain why do certain individual adopt new technologies whereas other's don't? It is important to an organization that provides technology-based products or services.

Another behavioural theory that widely used to predict user behaviour intention to use technology is TAM (Technology Acceptance Model). TAM (Technology Acceptance Model) studies have been used widely in the field of Information Systems or Information Technology (IS/IT) in order to obtain a more comprehensive perspective and a better explanation of the process of acceptance of technology on individuals [20]. TAM concept offers a simple yet powerful explanation related to technology acceptance and usage behaviour [21]. The main factors that can influence were perceived usefulness and perceived ease of use of Information Technology (IT) as an act that is reasonable in the context of technology users, so the reason someone in to see the benefits and ease of use of IT to make the action/behaviour of people such as the benchmark in the reception a technology. Based on Davis, the level of IT utilization by the user will be largely determined by the level of user acceptance, while user acceptance can be predicted from perceived usefulness or "how beneficial the technology (to increase productivity)" and perceived ease of use, or "how easily these technologies can be used (less effort to use) " [21]. Based on Davis, both of factors could explain the behavioural aspects of users and found significantly influence user acceptance of the technology. These findings was also supported by other studies [22][23][24].

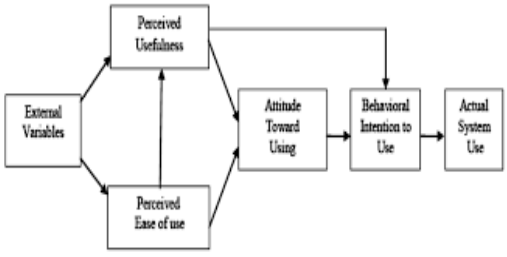

Fig. 4 Technology acceptance model [21]

According to Figure 4 above, it could be seen that there is

five constructs in TAM model including perceived usefulness, perceived ease of use, attitude toward using, behavioural intention to use and actual system use. In other words, TAM model used to measure the level of user's technology adoption.

If observed further, the TAM theory also has weaknesses although TAM is a simple but powerful parsimony model. The weakness of TAM model is not taking into account of social influence and condition of facilities that encourage user behaviour in using technology. In another word, TAM is limited in its ability to consider the influence of external variables and barriers to technology acceptance.

In addition, the TAM model is only used to measure user behaviour in voluntary conditions. In the voluntary use of information technology, the measure of success is usually based on user acceptance. The end user has full freedom whether the user will use or leave the technology [25][26]. But on the mandatory use of technology, the indicator of success is user satisfaction. The other weakness of TAM models is that TAM only emphasises measurements of technological aspects only that benefit from the technology and the ease with which these technologies are offered. Internal factors, ie individual personality traits are not measured in the model whereas personality traits are antecedents of the cognitive dimensions of TAM [27][28]. Then some researchers try to extend TAM by considering individual personality like TRI. Lin report that they adapt and construct an integrated TRI-TAM called TRAM model in order to indicate the user adoption of high technology services by associating TR with the two dimension of TAM, perceived usefulness and perceived ease of use [29]. Basgoze (2015) also combine or integrate TR into TAM in the context of mobile shopping intention [18].

The UTAUT model was introduced by Venkatesh (2003) which integrates eight behavioural theoretical models [30], namely the Theory of Reasoned Action (TRA), Technology Adoption Model (TAM), Motivational Model (MM), Theory of Planned Behaviour (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization, Diffusion of Innovation Theory (DOI), and the Social Cognitive Theory that could be shown in Figure 5 below:

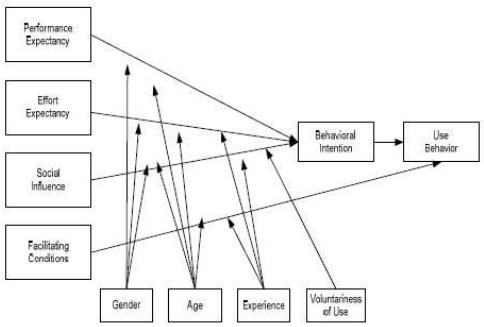

Fig. 5 UTAUT model [30]

The successful implementation model of Delone & McLean is one of the most widely used frameworks in successful IT implementation research [31]. The model measures the success of IT implementation from a non-economic point of view, or in other words success is measured by indirect measure or surrogate measure in the form of user behaviour. DeLone & McLean argue that the success of IT implementation can be assessed or predicted from user acceptance and user satisfaction for IT, where both user acceptance and satisfaction are influenced by external factors [32]. The Delon & McLean model is using user satisfaction as an indicator of successful IT adoption where IT system was mandatory. User does not have the option to use another technology (ie core banking applications). Therefore, the model is not suitable for any particular voluntary system. All best practices model of technology adoption explained above (ie. TRI, TAM, UTAUT, Delon & McLean) has been widely used to investigate user acceptance and user adoption of Information System/Information Technology (IS/IT), but these model are very general and are not designed for any particular system. Because each system has special contextual characteristics that may affect IS/IT adoption behaviour [33]. Therefore, further support is recommended to develop a model of user adoption especially in the context of e-Government in Indonesia.

III. RESULTS AND DISCUSSION

Based on technology diffusion or adoption process theories [12][13], the critical issue is related to the mental process of accepting new ideas and practices. Therefore, it is important to better understand the user acceptance of factors that could influence user acceptance of e-Government system. As explained above, there are several acceptance models that have been widely used to explain the user acceptance of Information System such as TAM, UTAUT, etc. TAM is still one of the most frequently tested models in information system literature and has been applied in various samples of users in a wide range of information technology [34]. Many scholars have revised the TAM to enhance its interpretation abilities. In the e-Government context, Putra (2008) examines the behaviour of interest in city government officials in using e-government system with TAM approach. Putra (2008) mentions that the TAM model can be used in the context of e-Government considering that e-Government is also part of the information system [24]. Jaeger & Matteson (2009) and Al-adawi (2005) seeks the technology acceptance factors to understand the process government agencies adopting e-Government [35][36]. Navarro (2014) extended TAM framework to confirm the explanatory power of attitude towards a technology on citizen engagement in e-Government services [37].

The main factor for using the TAM model in the previous study is that it has been proven and well accepted by many researchers with a focus on user acceptance factors regarding e-Government system. Based on TAM, user acceptance is influenced by perceived usefulness and perceived ease of use; thus, we defined our proposed model by modifying the TAM model-adding additional factors in order to better understand the external variables regarding user technology acceptance.

The external variables proposed by UTAUT model consist of performance expectancy, effort expectancy, social influence and facilitating conditions. Perceived usefulness (TAM) or performance expectancy (UTAUT), is defined as the degree to which a person believes that using a particular system would enhance his or her job performance [30]. Users may feel that using e-Government can assist them in

completing their work quickly and improving their job performance and productivity. Perceived ease of use (TAM) or effort expectancy (UTAUT) relates to the degree to which users believe that the e-Government system is easy to use or the degree to which a person believes that using a particular system would be free of effort [38].

Social influence factor in UTAUT model is defined as people's perceptions of whether or not most people important to them would think they should perform the behaviour. Social influence demonstrated a significant influence on the intentions of individuals using technology in previous studies [39][40][41][42].

Facilitating conditions in UTAUT model is defined as the objective factors in the environment that observers agree make an act easy to perform, including the provision of computer support. Ismail and Mohamadali & Garibaldi showed that facilitating conditions adequately enhance user acceptance through perceived usefulness and ease of use [43][44]. These facilitating conditions provide a user manual with clear instructions on how to use an application, specialised units, or personnel to manage e-Government system, and adequate supporting resources (i.e., computers, laptops, and networks).

Information quality in Delon & McLean Success model is defined as the degree of excellence of the information produced by the software or system, which focuses on issues related to the timeliness, accuracy, relevance, and format of the information produced by the system [45]. Nguyen define information quality as exhibiting accuracy, completeness, timely access, availability, improving readability, and the ability to handle a lot of data or information attributes [46]. Mohamadali & Garibaldi and Hsiao et al. state that the information quality influences user acceptance through perceived usefulness and ease of use [44][47].

System quality in Delon & McLean Success model is defined as the degree of excellence of the software or system and focuses on user interface consistency, ease of use, system response levels, system documentation and quality, ease of maintaining the programming code, and whether the system is free of bugs [30]. According to Mohamadali and Garibaldi, system quality can be measured based on the performance of the overall system. For example, if there are a lot of bugs in the system [44], the user will tend not to use the system, and the system cannot perform tasks according to the needs of its users. Therefore, system quality can influence user acceptance through perceived usefulness and ease of use.

Service quality in Delon & McLean success model is the quality of the resulting system whether the user is willing or not and to what extent the system can assist users in generating jobs. Service quality added into Delone & McLean model is based on the consideration that recent development on IS/IT have shown that IS/IT is no longer just a product but also a provider of services [32]. Therefore, service quality also influences user acceptance through perceived usefulness and ease of use.

In TRI model, individual readiness to use new technology is measured based on their psychological traits. According to Agarwal & Prasad and Karahanna & Straub, Psychological traits are antecedents of the cognitive dimensions of TAM [27][28]. However, many researchers (Lin, have made an effort so far to combine psychological traits (TRI) and cognitive antecedent to the technology used (TAM) in one model called TRAM (Technology Readiness Acceptance Model). Basgoze (2015) extend TRI by considering TAM in the context of Mobile Shopping [18]. Walczuch also combined TRI and TAM in order to measure the relation between both models [48]. Lin integrates TRI and TAM model to address the issue of consumer adoption of e-services as shown below [29]. Therefore in this research, we will also use the integration of TRI and TAM as part of our model.

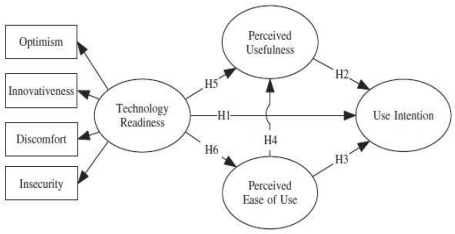

Fig. 6 TRAM model [29]

Besides that, there are other variables that influence or encourage the adoption of e-Government. According to Warkentin, Citizen Trust is an important predictor of e-Government system usage [49]. Trust by definition is cohesive prominently to behaviour intension [11]. Based on Abu-Shanab, Berdykhanova and Faisal & Rahman that Trust is an issue in e-Government and found to be important factors for scholars [50][51][52]. Other researchers that report Trust in e-Government become independent variable and dependent variable [53][54][55].

Another variable which also is a significant element in e-Government adoption is Compatibility [56][57]. Compatibility is defined as the degree to which an innovation is perceived as being consistent with the existing values, needs, and experiences of potential adopters [58]. Previous studies have found that compatibility is an important factor impacting the willingness of individuals to adopt technology [47][58].

Based on literature study about state of the art of technology adoption model especially in the context of e-Government, there are twenty-six (26) hypotheses in this conceptual model can be derived as follows:

H1 : Perceived Ease of Use (PEOU) significantly positive influences the Perceived Usefulness (PU)

H2 : Perceived Ease of Use (PEOU) significantly positive influences the Behavioural Intention (BI)

H3 : Perceived Usefulness(PU) significantly positive influences the Behaviour Intention (BI)

H4 : Optimism (OPT) significantly positive influences the Perceived Ease of Use (PEOU)

H5 : Optimism (OPT) significantly positive influences the Perceived Usefulness(PU)

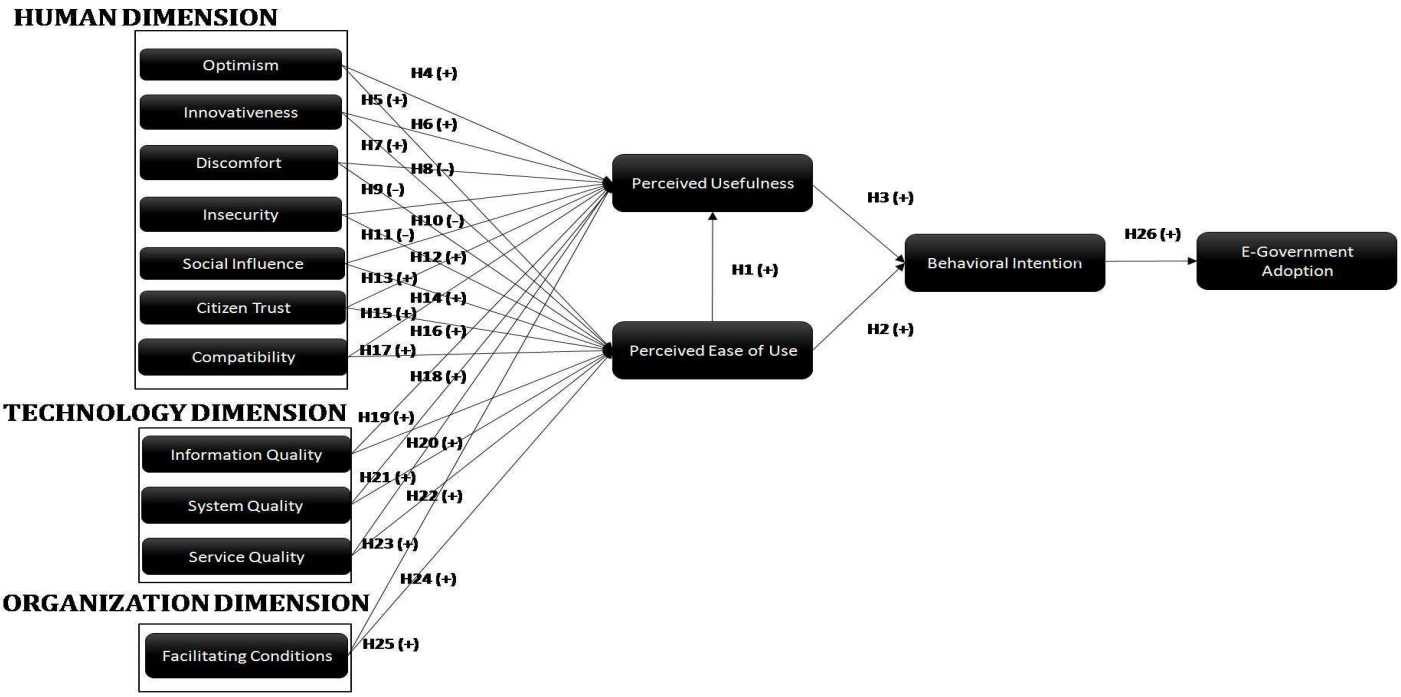

Fig. 7 Proposed conceptual model of user adoption for e-government system

H6 : Innovativeness (INN) significantly positive influences the Perceived Ease of Use (PEOU)

H7 : Innovativeness (INN) significantly positive influences the Perceived Usefulness(PU)

H8 : Discomfort (DIS) significantly positive influences the Perceived Ease of Use (PEOU)

H9 : Discomfort (DIS) significantly positive influences the Perceived Usefulness(PU)

H10 : Insecurity (INS) significantly positive influences the Perceived Ease of Use (PEOU)

H11 : Insecurity (INS) significantly positive influences the Perceived Usefulness(PU)

H12 : Social Influence (INS) significantly positive influences the Perceived Ease of Use (PEOU)

H13 : Social Influence (INS) significantly positive influences the Perceived Usefulness(PU)

H14 : Citizen Trust (CT) significantly positive influences the Perceived Ease of Use (PEOU)

H15 : Citizen Trust (CT) significantly positive influences the Perceived Usefulness (PU)

H16 : Compatibility (COM) significantly positive influences the Perceived Ease of Use (PEOU)

H17 : Compatibility (COM) significantly positive influences the Perceived Usefulness (PU)

H18 : Information Quality (IQ) significantly positive influences the Perceived Ease of Use (PEOU)

H19 : Information Quality (IQ) significantly positive influences the Perceived Usefulness (PU)

H20 : System Quality (SQ) significantly positive influences the Perceived Ease of Use (PEOU)

H21 : System Quality (SQ) significantly positive influences the Perceived Usefulness (PU)

H22 : Service Quality (SEQ) significantly positive influences the Perceived Ease of Use (PEOU)

H23 : Service Quality (SEQ) significantly positive influences the Perceived Usefulness (PU)

H24 : Facilitating Conditions (FC) significantly positive influences the Perceived Ease of Use (PEOU)

H25 : Facilitating Conditions (FC) significantly positive influences the Perceived Usefulness (PU)

H26 : Behaviour Intention (BI) significantly positive influences the E-Government Adoption (EA)

Based on Figure 7 proposed model, Total 11 independent variables are classified into three dimensions related to user adoption factors: humans, technological and organizations. This classification made followed the suggestions of other researchers [38][59], especially for developing countries. Therefore, the human dimension has 7 factors, technology dimension has 3 factors and organization dimension has 1 factor in this research.

Human dimension consisted of factors influence level of user readiness and perceived value of adopting e-Government system. Human dimension related to psychological factors of users which are driving in using technology in the e-Government context. Thus, human dimension includes optimism, innovativeness, discomfort, insecurity, compatibility and social influence factor. In the other hand, technology dimension related to capabilities provided by means of technology.

Technology could enhance the user acceptance and of e-Government system by providing excellent system and support for users. Thus technology dimension in this proposed model includes information quality, system quality and service quality factor. Organization dimension related to the aspect that should be managed by organization in order to improve user acceptance of technology in the context of e-Government. In this proposed model, organization dimension emphasised the facilitating conditions availability in the organization. This is not limited to equipment or facilities, but also including the skilful people and structure that manage e-Government in the organization.

IV. CONCLUSIONS

This research had explored various factors that influence user adoption of e-Government system in Indonesia. Some best practice model such as TAM, TRI, UTAUT, Delon & McLean IS Success Model related to user acceptance and other important factors including trust and compatibility was adapted to develop proposed model of e-Government adoption. Therefore, twenty-six (26) hypotheses related to the user adoption in the context of e-Government system with total 15 constructs had also been proposed in this research. The proposed model has 11 independent variables that classified into 3 dimensions: human dimension, technology dimension and organization dimension. The user adoption model of e-Government which is developed can be used to get a better understanding on important issues on e-Government adoption process. In the future research, the conceptual model should be supported by extending the set of empirical data to test the hypotheses that had been proposed in this research.

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