

An Integrated Framework for Measuring Information System Success Considering the Impact of Culture in Indonesia

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Abstract— This paper aims to propose a framework for assessing information system (IS) success considering the impact of culture. Previous frameworks for assessing information system (IS) success, such as DeLone and McLean model, only concern about the status of IS implementation itself. But none of the models have included the dimensions for assessing culture even though researchers have shown the strong relationship between culture and the success (or failure) of the IS. The inclusion of culture in the IS success model is very important, especially in Indonesia, since culture plays as a dominant part in almost all aspects of citizen's lives. This paper is expected to make a contribution on providing a framework for assessing IS success considering the impact of culture. To validate the proposed model, a mixed-method research design is proposed.

Keywords— *information system success; DeLone-McLean model; Indonesian culture; Hofstede culture dimensions*

I. INTRODUCTION

In the IS project development, failures are common. Based on Standish CHAOS Report in 2013, 18% of IS project in 2012 had failed [1]. Even though the trend of failure percentage has been decreasing, but since building an IS is considered expensive, therefore 18% actually is a big loss. An information technology (IT) project is considered fail if it is cancelled or not being used by users after the delivery of the system [2].

In Indonesia, the exact number of IS failures is hard to discover. The available evidence is limited to certain sectors and regions. For example, the e-health project research from PT Telkom (PT Telekomunikasi Indonesia) has shown that 76% of IS deployment by hospitals has failed [3]. Other initiative that has a low percentage of success is e-government. Based on the United Nations E-Government Survey, Indonesia had slid down from rank 70th in 2003 to 106th in 2014[4]. Learn from the UN survey since 2003 where the ranks of the countries are fluctuated, it is too early to conclude that e-government in Indonesia will be in the higher rank next year. E-government ranks of several countries, such as Jordan and Thailand, have been down from the previous year. For that reason, a serious commitment from Indonesia government is needed for retaining, or even increasing, the quality of

Indonesia e-government. In a study of e-government in Sragen, Central Java, it was revealed that a strong political leadership is the important factor that influences e-government success [5]. Since leadership is heavily affected by culture as mentioned in [6], therefore culture could affect IS indirectly. Further, culture can affect IS implementation directly through the behavior of its users.

It has been proven scientifically that people's behaviors are affected by the culture where they live or brought up during certain period that affect their lives saliently [7]. Culture influence on how people see themselves and others, and it will affect the way they interact with people around them [8]. Numerous research in technology acceptance field have shown that people are under social influence upon their decision on using certain technology. Recommendations from people around them, especially from the prominent figures, affect the decision in a great extent. Culture also affects the way people communicate, both verbal and non-verbal [9]. The non-verbal communication is expressed in non-verbal behavior, such as gestures, gaze and interpersonal space. This explains how culture has become the obstacle of e-government implementation in Kuwait. It was revealed that Kuwait people prefer face-to-face communication when they need to "talk" to government or need government services [10].

Since culture might interfere with IS implementation, therefore when assessing an IS, it is important to include the assessment of the culture of the users. The available frameworks for assessing IS success so far do not include the culture variables in the models. In other word, there is a need to address this gap. The objective of this paper is to propose a conceptual framework based on the literature review. The proposed framework is expected to be used as a tool for assessing an IS with culture consideration. The culture that provides a fertile ground for a success of IS implementation is desirable. If the culture turns out to be the barrier for IS implementation, project leader might set up certain programs to minimize the negative effect of the culture.

Hofstede's national culture theory is the culture theory that is used very often in the IS research. Despite the fierce debate that have been sparked about the validity of national culture theory, Hofstede's national culture theory is still being used

and considered the most culture theory used in IS research [11].

II. IS SUCCESS MODELS

A. Some Prominent IS Success Models

Several models for measuring IS success factors have been proposed by some researchers such as [12], [13], [14], [15], [16], [17], and [18]. One of the widely accepted models is DeLone-McLean IS success model [12], and the updated version in [13]. The popularity of DeLone-McLean model can be seen in Table I. It is shown that DeLone-McLean model has the highest number of citation count (original and updated versions combined).

Besides the number of citation, DeLone-McLean model is considered a good theory based on the virtues of good theory by Wacker [19]. DeLone-McLean model has been used as a base for building some other IS success models, such as [16], [17], and [18].

TABLE I.
SOME PROMINENT IS SUCCESS MODELS

Theory / Framework	Number of Citation
DeLone-McLean (1992)	6451
Seddon (1997)	1499
DeLone and McLean (2003) – the updated version of DeLone and McLean (1992)	4235
Gable et al. (2003)	232
Wixom and Todd (2005)	1096
Gable et al. (2008)	248

B. DeLone-McLean IS Success Model

Originally, DeLone-McLean model has six latent variables which are Information Quality, System Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact. Based on the suggestion from several researchers, including [16], DeLone and McLean updated the model as shown on Fig. 1. The major changes of the model are the addition of Service Quality an Intention to use, and the replacement of Individual and Organizational Impact by Net Benefits. DeLone and McLean argued that Net Benefits is more appropriate (rather than just “Impact” that can be positive or negative) since IS will be considered as success if it gives positive impact (benefits) to both individual and organization.

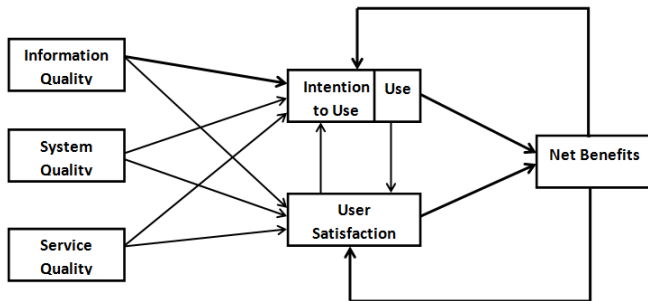


Fig. 1. Updated DeLone-McLean IS Success Model [12]

DeLone and McLean model was built on the assumption that information system basically is transferring the information from the producer to the recipient, based on the theory of communication by [20]. But [21] argued that information system is a unique type of communication process where people involved as the media of transformation. While hardware and wires will do whatever the system asks them to do, in contrast, people might do the opposite. Reference [21] provided some reasons for his argument.

1. The model of communication assumes that information transmission is context-free. That means when the sender send information and received by the recipient, the information will have exactly same meaning. In communication that involved people, i.e. information system, the context is important. Among the important contexts that have to be considered are “situational, social, institutional, political, cultural, and historical”. The contexts will affect the receiver on perceiving the meaning of information.

2. The model of communication assumes that all participants in the communication system are not aware of the presence of others or “totally isolated”. In real life, people are social being that are always connected socially with other people who involved in communication. Further, Chandler wrote that “...We are all social beings, and our communicative acts cannot be said to represent the expression of purely individual thoughts and feelings. Such thoughts and feelings are socio-culturally patterned” [21].

The implication of the notion that communication theory will not be valid for human unless culture involved is modifying DeLone-McLean model by inserting culture variables into the model.

C. The Need for Culture Inclusion

Study of culture in IS research provides abundant benefits since IS tends to be implemented in cross-cultural setting, especially after the internet proliferation that makes countries are borderless. The implementation of IS will affect people with different cultures background. The benefits of studying culture includes for training preparation, conflict resolution, choosing a leadership style, and management control system [22].

As defined by DeLone and McLean in [12] and [13], a success information system bears the characteristics of good information and system quality, adequate quality of service, high frequency of system use, high level of user satisfaction, and the system provides benefits to individual and organization. The culture addition will provide insight on the characteristics of culture that is expected to exist and being practiced among people (users) which support the success of information system.

Technology acceptance research is an IS research branch that frequently use culture along with technology acceptance framework, such as [23], [24], [25], [26]. The hypothesis that generally needs to be proven is whether culture influences user’s willingness to use certain technology. The willingness is actually the intention that arises from psychological urge. Based on the theory of planned behavior (TPB), in certain

conditions, the intention will lead to actual behavior [27]. As stated in [28] that "...culture affects people behavior, thought, and feeling" then the connection can be drawn between culture, intention and behavior. In the IS success model, acceptance toward new information system is translated as "intention to use" the IS and then followed by the actual "use" of the system continuously.

III. CULTURE CONCEPT IN IS

A. Hofstede's Culture Dimensions: Prominent Culture Concepts in IS Research

Hofstede's national culture dimensions is a culture theory that have been used very often in IS research [11]. In Hofstede's culture dimension, each country (of total about seventy countries) has its culture dimensions' indexes. These "predefined" indexes are very helpful and useful for researchers who are willing to conduct research using national culture.

Hofstede divides culture characteristics into four (later become six) dimensions which are Power Distance, Individualism vs. Collectivism, Masculinity vs. Femininity, and Uncertainty Avoidance [29]. The original score of culture dimensions was extracted from data of around 100,000 IBM employees. This method was questioned by some researchers whether few sample of people from certain nationality will appropriately represented the whole nation [11], [30], and [31]. Nevertheless, since Hofstede's work provides guidelines of culture mapping for most countries in the world, therefore numerous researchers keep using Hofstede national culture theory in the research.

B. Is There Culture Shifting in Indonesia?

Under Hofstede's four culture dimensions, Indonesia has characteristics of high Power Distance index, low on individualism, somewhat low in masculinity, and moderate low in uncertainty avoidance. But in a study for validating Hofstede's culture dimensions in Indonesia, [32] found an interesting result. The culture dimensions have been "shifted" from Hofstede's scores, with the only exception on Uncertainty Avoidance which its change is trivial (Fig. 2).

The change in culture dimensions such as shown in Fig.2 is possible since "...culture is a moving target" [11]. That means it is highly possible that culture might change. Further, [11] stated that culture is "invented and reinvented and always in a state of flux". Therefore assuming that culture is always stable and never changing is plausible. It is rather ironic since most researchers usually apply the common method for involving culture in IS research by assuming that culture characteristics are given as defined by Hofstede and remain the same, even after more than two or three decades.

Several IS studies that used Hofstede's culture dimensions include [33], [34], and [35]. Even though many studies have proven that Hofstede's theory are sound and held scientifically, further research is needed to reveal the shifting culture as effect of globalization and information technology innovation [22].

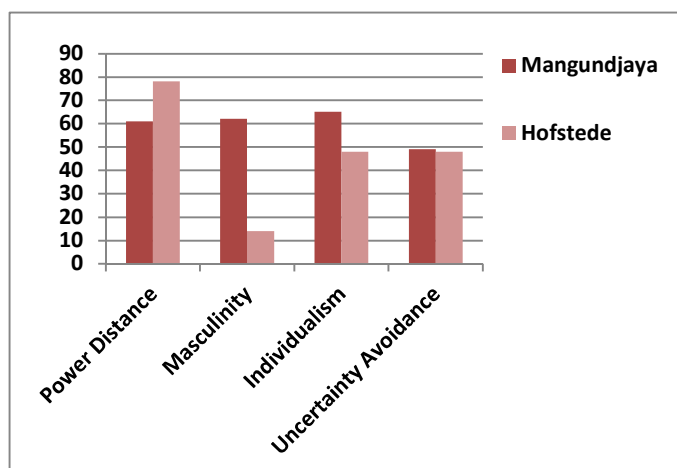


Fig. 2. . Indonesian culture shift [32]

C. The Effect of Culture Shifting on IS

The shifting of culture might affect the acceptance of people toward new technology or new IS. It is shown in Fig. 2 that the biggest shift in Indonesia culture is masculinity. Indonesian's masculinity index has increased sharply from 14 to 62. Masculinity refers to the culture that gives a higher appreciation on the materialism and power. People in this culture prefer new challenge, competition, and have a high ambition to reach their goal. In term of technology acceptance, masculinity culture is more receptive toward new technology since new technology is equal to challenge. High masculinity means low in femininity, and feminine culture is correlated with social influence.

Social influence (social norm) has a higher effect in the feminine culture (low masculinity) [24]. Social influence is defined as the extent of influence of important others toward a person. A person with high social influence will always consider what other people think about his/her action. As the opposite, people in high masculinity (such as shown in Fig. 2) will tend to do whatever they need to do to reach their goals and ignore what other people say about it. In term of acceptance toward innovation and new technology, the shift of Indonesia culture is somewhat promising. It will be easier to promote innovativeness and the implementation of new information system or information technology.

But in some cases, social influence is needed to push technology acceptance, especially in collectivism culture and high power distance. Under social influence, people will accept new technology because they want to conform toward the important others or superior people [36]. Further, the IS in mandatory setting is more likely to be successful under social influence.

IV. CULTURE INCLUSION IN DELONE-MCLEAN MODEL

A. Hofstede Culture Dimension and Information Technology

The role of culture in the IS success model is to assess whether the characteristic of culture supports new innovation. The new innovation in this paper refers to information

technology/information system implementation. For example, high individualism and lower power distance will promote innovativeness [37], [38]. But a study by [39] found that high Power Distance in China is the underlying reason for decreasing e-mail usage. In a culture with high power distance, people acknowledge that there is gap between them and the authority (people in power). The acknowledgement is expressed through a high respect toward people of the higher power. In such culture, talk to the people with higher power without meeting them in person is considered as disrespectful action.

In a study of instant messaging system in Mexico and US, [40] found that collectivist culture has positive impact on the intention to use text-based messaging. Further, they explained that in the collectivist culture, intense pressure from society affect people’s decision making. If other people use instant messaging and he/she does not, he/she will be left out from the group or society.

Uncertainty avoidance refers to the extent to which people prefer to avoid the uncertainty and ambiguity [41]. Researchers are divided in understanding and applying the concept of uncertainty avoidance toward technology. The first group, researchers view new technology or information system is equal to risk, therefore it poses to uncertainty. Some people view new technology as a threat that will bring to uncertainty. For example, in a study of executive information system (EIS), [42] stated that in a country with low uncertainty avoidance, managers are more welcome toward using EIS. In such culture, uncertainty and risk are not avoided. New technology is welcome even though such project like EIS is mostly risky. Another study that holds similar view is [43] which sees that information technology bears the risks for data theft, data loss, corruption of data, destruction of data, and denial of service. The effect of such threat will be very detrimental to the organization. Therefore, information technology brings more uncertainty and unstable future. Culture which has high uncertainty avoidance will choose to avoid information technology implementation.

The second group of researchers views that a culture with high uncertainty avoidance is the culture that is more receptive toward new technology since they “... look for structure in their organizations, institutions and relationships, which makes events clearly interpretable and predictable” [41]. This group of researchers views computer or technology as tools for reducing the uncertainty. Technology will help to clarify the ambiguity. For example, financial reports will be more precise with the help of computer (compare to the era before computer). The researchers in this group are including [25] and [26]. Mapping Hofstede’s culture dimensions on the possibilities of their impacts toward technology implementation is shown in Table II.

As seen in Table II, the characteristic of a culture could have a positive and negative impact on information system or information technology. Applying Indonesian culture characteristics as shown in Fig. 2 to Table II will give the possibilities as follows:

- High Power Distance: On the positive side, IS/IT implementation in Indonesia will be a success if the leader (or

people in the higher power) use their power to persuade subordinate users to use the IS/IT. But on the negative side, people will be reluctant to use a technology that foster an egalitarian life style, such as the case of decreasing e-mail usage in China (Huang et al., 2003).

TABLE II.
THE POSSIBILITIES IMPACT OF HOFSTEDE’S NATIONAL CULTURE ON TECHNOLOGY/INFORMATION SYSTEM

Hofstede’s Culture Dimensions	Possible Impact on Information System/Information Technology	
	Positive	Negative
High Power Distance	Subordinates are easily to be forced to use information system or technology (especially in mandatory environments).	Technology will be seen as a threat that will decrease the power distance.
Low Power Distance	Technology will be seen as a tool that match with the culture. Technology is seen as part of egalitarian life styles.	It is hard to forced people to use certain technology.
Individualism	Technology that promotes individualism life styles, such as internet, will be easily adopted.	Technology that promotes teamwork, such as group support system, will be hard to be accepted.
Collectivism	Pressure from group members can boost the technology adoption or information technology usage, such as the case of instant messaging system in Mexico.	Pressure from group members might prevent somebody to use certain technology.
Masculinity	In a culture where hardwork is highly valued, tehnology is viewed as a tool for achieving the goals. The ability for operating certain technology is also highly valued. Hedonic technology is also easier being accepted in masculine culture.	Masculinity almost does not have negative effect on technology.
Femininity	Femininity culture promotes relationship, hence fosters trust and knowledge sharing.	Technology will be seen as an obstacle that separates the closeness of family members (consider the excessive use of gadgets among family members).
High Uncertainty Avoidance	See technology as tools for minimizing uncertainty, provide precision, clear system and procedure, provide assurance and timely manner.	Technology is seen as a threat, high risk, and vulnerable.
Low Uncertainty Avoidance	See technology as a part of innovation and creativity, provides new challenge and opportunity.	Technology and IS are viewed as barrier for creativity.

- High Masculinity: On the positive side, IS/IT implementation in Indonesia will be most likely a success

since high masculinity is a culture that leads to hard work, competition, and technology friendly. Fortunately, there is almost no negative effect of masculinity culture toward technology adoption. But since high masculinity also means low in femininity, therefore precaution has to be taken when implementing IS/IT that support knowledge sharing and need trust such as e-commerce.

- High Individualism: On the positive side, IS/IT that promotes individualism will be accepted easily in Indonesia. But on the negative side, technology that foster team work might be hard to be adopted.

- Low Uncertainty Avoidance: If people see that the technology poses to high risk and uncertainty, the technology will be rejected. On the other hand, if people see technology provides a new challenge and opportunity, drives toward innovation, the technology will be accepted easily. In a study of Minangkabau entrepreneurs, [44] found that low uncertainty avoidance has a positive effect toward innovativeness. High uncertainty avoidance means that people tend to set the strict rules, prefer standardization, and avoid variation since variation is equal to uncertainty. In [44] study, low uncertainty avoidance is the surrogate for creativity and innovativeness.

B. Culture Dimensions in the DeLone-McLean Success model

The integration of culture dimension into DeLone-McLean model is based on the theoretical background that Intention to Use is the only variable in the DeLone-McLean model that can be affected by culture. This notion is implied by [52] that national culture can predict the intention. Similar argument stated in [28] that people’s behavior, thought, and feeling are affected by their culture. People with salient culture values will behave in certain ways according to the norm of their culture. In the case of information technology adoption, this notion supports [45] which concluded that “cultural values shape how people use information technology”.

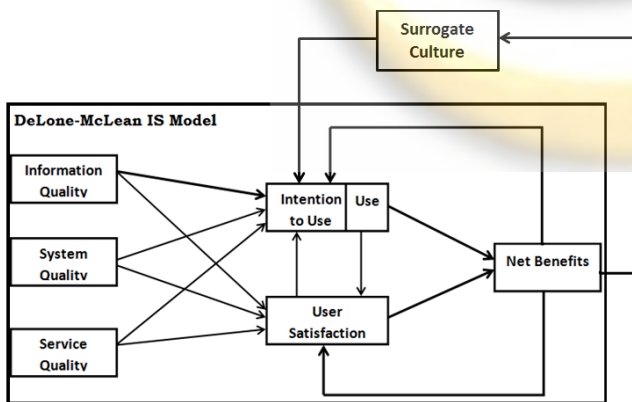


Fig. 3. The inclusion of culture dimensions in DeLone-McLean IS Success model.

In Fig.3, culture is notated by Surrogate Culture which is the culture that fosters the success of the IS. The surrogate culture is expected to positively affect users intention to use

the IS since the most important characteristics of a success IS is being used continuously by its users [2].

While culture affects intention to use technology, culture also gets impact from technology. When people use technology, technology might reciprocally change the people. For example, the internet technology development has changed daily social life through the changing on the way people communicate [46]. Technology has changed the way people interact with each other, or even change rituals in culture (for example the case of marriage ceremony using telephone or video conferencing). Face-to-face communication is getting less important for certain people. Therefore in the proposed new model (see Fig. 3) the influence of technology toward culture is depicted by arrow from Net Benefits to Culture Dimensions. This arrow means that a successful information system will give positive impact to culture or contribute for shaping the culture. As mentioned by [22], information system or information technology affects the way people communicates to each other and finally IS can influence the culture of people.

V. CONSTRUCT VALIDITY AND SUGGESTED RESEARCH METHODOLOGY

The conceptual framework proposed in this paper is an ongoing research and has not been validated yet. The proposed framework is actually the extended version of DeLone-McLean model with culture addition as shown in Fig.3. The construct validity of the DeLone-McLean’s part of the framework has been done by numerous previous studies such as [47], [48], and [49]. Further analysis on the validity of the DeLone-McLean model is provided by several meta-analysis studies such as [50] and [51] that gave mixed results on the significance of certain relationships in the model. Further studies have to carefully examine the result of the meta-analysis studies to get deeper and better understanding on the DeLone-McLean model.

Traditionally, both DeLone-McLean model and Hofstede culture dimensions use self-reporting questionnaire for data collection and quantitative approach for research methodology. But several researchers have given precaution on using such methodology for capturing and interpreting culture since some characteristics of culture are hard to be observed through questionnaire or survey. Similar notion is mentioned by [45] that defining and measuring culture is the biggest challenge in IS research involving culture. In another study, [52] stated that, “There is a need within IS for there to be interpretivist, critical, positivist, quantitative and qualitative research”. One of good examples of research method for gathering cultural values was given by [53] which used qualitative study to tap the underlying facts regarding cultural impact on information system implementation. Therefore in conducting further research for validating the proposed model, it is strongly suggested to use mixed method research design.

VI. CONCLUSIONS AND FURTHER RESEARCH

So far the measurement of information system success mostly concerns about the technical aspect of the system. IS research needs to expand its scope to include culture as an

emergent discipline into IS/IT discipline. This paper contributes on providing the insight on how culture might be included into the IS assessment. The existence of culture that affect IS/IT implementation cannot be ignored. The fact that until recent years the failure of IS projects remain high is a wake-up call to find the possibility of culture contribution into the matters. Researchers have long proved that technology adoption and information system success cannot be separated from culture influence. As in any project, as long as it involves people, the underlying source of behavior pattern, values, and feeling are worth to be studied. That is especially true for Indonesia which is rich in culture. The inclusion of culture in the IS success model is expected to provide valuable contribution for both academic research and practical implementation.

Besides for validating the model, further research is needed to define the recent culture dimensions of Indonesia since we get the notion from research that culture is always changing. The influence of global market and internet proliferation has changed society at large. Indonesia is not the exception. As shown in Fig. 3 that information system could affect culture, thus the changes on culture values are highly possible. Defining the newest culture values is important to provide the decision maker with some guidelines for planning IS/IT projects.

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