AN INTEGRATIVE MODEL OF INSTRUCTORS' ICT USE IN HIGHER EDUCATION IN DEVELOPING COUNTRIES

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Abstract

Scholars have exerted efforts to develop models that inform the use of technology in higher education. However, the models largely disregard the context of developing countries. In this paper, a model that is responsive to contexts of higher education in developing countries is presented. The model is developed by integrating the findings of a mixed-method study in Ethiopia and a further review of the literature. It consists of determinants in six categories, namely: institution, instructor, student, technology, culture and academic discipline. It is suggested that future researchers might be focused on testing the proposed model.

Keywords: Integrative model, developing countries, instructors, ICT use, higher education

Background

ICT is known to transform higher education (HE) by promoting innovative teaching methods (Albayrak & Yildirim, 2015). However, it is yet to be an integral part of HE teaching (Gamage, 2018) and hence the search for factors that influence successful ICT integration remains to be an important area for scientific investigations. Though scholars have dedicated their research to developing models and theories that inform the use of technology, the models largely disregard the context of developing countries. Hence, researchers need to consider developing models that suit the local contexts of countries. Between 2018 and 2022, a mixed-method study was conducted to develop an ICT use model tailored to the context of HE in developing countries (see. Ferede, Elen, Van Petegem, Hunde & Goeman, 2021; Ferede et al., 2022). The study ultimately showed that only instructors' ICT competence and attitude are direct significant predictors of their ICT use. Since the two determinants together explain only 35% variation in instructors' ICT use, the need for further investigation of a holistic (with additional variables) and at the same time powerful model of instructors' ICT use is crystal clear. In this paper, therefore, an integrative model of instructors' ICT use is proposed.

Constituent categories and distinct factors of the integrative model

The integrative instructors' ICT use model consists of both empirical and conceptual components. The empirical part consists of determinants that are supported by the two prior studies that involved qualitative (focus groups) and quantitative (survey) studies consecutively. It encompasses factors in four categories namely, institutional characteristics, instructors' characteristics, students' characteristics and academic discipline. Determinants in the institutional and instructors' categories resulted from the structural equation model analysis whereas students' characteristics and academic discipline are supported by the qualitative study. The conceptual part of the model consists of variables in three categories namely; instructors' characteristics (pedagogical beliefs), technological attributes and culture and language (Figure 0:1).

Institutional characteristics

At a university level, four variables are hypothesised as determinants of instructors' ICT use (see Figure 1). These determinants are selected based on evidence from prior qualitative (Ferede et al., 2021) and quantitative (Ferede et al., 2022) studies. The determinants are;

- ✓ *ICT vision and plan:* Refers to what a university aspires to realise using ICT use. ICT vision and plan have a direct influence on infrastructure, support and professional development.
- ✓ *ICT support*: Encompasses both technical and management support necessary for ICT integration. Support has a direct influence on infrastructure and professional development.
- ✓ *ICT infrastructure:* Relates to physical resources (e.g., computer and internet) needed for ICT use.
- ✓ *Professional development:* Refers to capacity-building interventions organised by universities and instructors' self-training. Professional development has a direct and indirect influence on attitude and ICT use respectively.
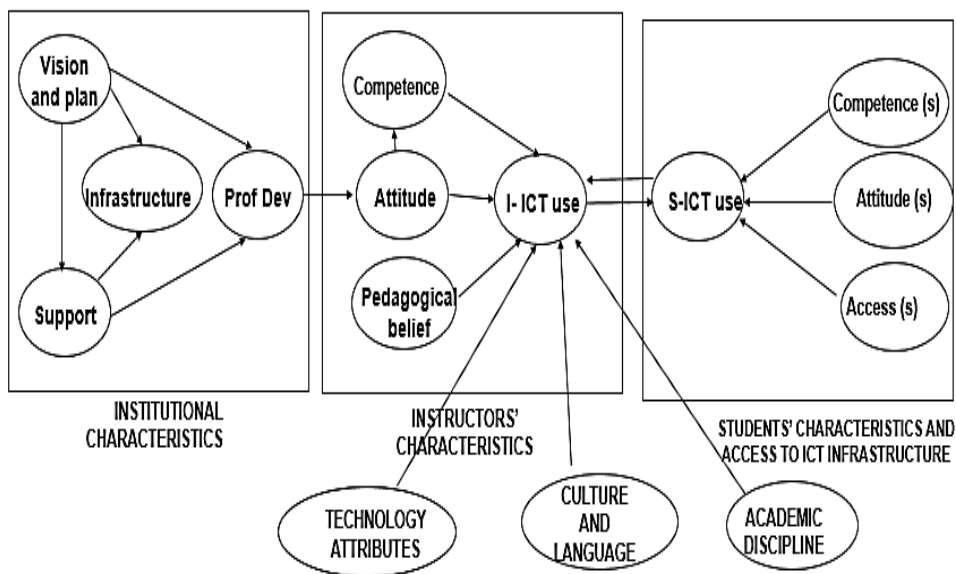

Figure 0:1 An integrative model of instructors' ICT use

Instructors' characteristics

Instructors' characteristics encompass ICT competence, ICT attitude and pedagogical beliefs. In the quantitative analysis, ICT competence and attitude were found to be significant predictors of instructors' ICT use (Ferede et al., 2022). Pedagogical belief is proposed in the integrative model as an additional determinant as studies indicate that it is a significant predictor of instructors' ICT use (e.g., Knezek & Christensen, 2015).

- ✓ *ICT competence* encompasses both technical ICT competence and skill needed to integrate ICT into teaching. ICT competence has a direct influence on ICT use.
- ✓ *ICT attitude* refers to the *i*nclination of instructors toward ICT and its use. ICT attitude has a direct influence on ICT competence and attitude.
- ✓ *Pedagogical beliefs* refer to the degree to which learning technologies are aligned to instructors' understanding, premises, or propositions about teaching and learning (Ertmer, 2005). Teachers' pedagogical belief has a direct influence on their ICT use (Knezek & Christensen, 2015). Despite its relevance, there is a dearth of scientific evidence regarding the influence of pedagogical beliefs on instructors' ICT use in the context of developing countries like Ethiopia.

Students' characteristics and access to ICT infrastructure

Students' characteristics encompass ICT competence, ICT attitude, and access to ICT infrastructures. Instructors only use ICT meaningfully when their students can use ICT and students' ICT use may in turn be determined by the extent to which they have access to ICT infrastructure and possess the required ICT competence and attitude.

- ✓ *Students' ICT competence encompasses* knowledge and skills of ICT. students' ICT competence significantly influences their ICT use (e.g., Gasaymeh, 2018). In our qualitative study, students in Ethiopian HE are reported to have limited ICT competence (Ferede et al., 2021).
- ✓ *Students' ICT attitude* refers to their predisposition to respond favourably or unfavourably to ICT use in learning (Ajzen, 1991). Users' (students') attitude towards ICT influences their level of ICT adoption (Bullock, 2004). In developing countries, students' negative attitude is reported to be one of the critical barriers to ICT use in HE even during COVID 19 crisis (e.g., Olum et al., 2020).
- ✓ *Students' access to ICT infrastructure* refers to the extent to which the internet, computers and various applications are easy for students to access. In developing countries, students rarely have access to ICT facilities (see e.g., Ferede et al., 2021) with a negative consequence on their ICT use. Instructors' ICT use is directly influenced by students' ICT use which in turn is influenced by students' competence, attitude and access to infrastructure.

Technological attributes

Perceived technological attributes relate to the qualities of technology that determine its use as perceived by instructors. Individuals or a social unit will adopt an innovation if they perceive it to have particular attributes namely, relative advantage, compatibility, complexity, trialability and observability (see Rogers, 2003). If instructors perceive ICT as compatible, simple, relatively advantageous, trialable and its result is demonstrable, they quickly and frequently adopt it. The five perceived technological attributes determine up to 87% of the variations in technology adoption (Ibrahim et al., 2015). The concept of compatibility substantially relates to two other determinants (pedagogical beliefs and culture) in the integrative model and hence is excluded from attributes of technology in the integrative model.

Culture and language

Culture is defined as "the collective programming of the mind which distinguishes the members of one human group from another" (Hofstede, 1997, p. 21). Hofstede's definition of culture stresses that culture is shared values, norms and understanding within the society that shape members' behavior (Johns, Murphy Smith, & Strand, 2003). According to Hofstede, culture has six dimensions: Power Distance, Individualism/Collectivism, Uncertainty Avoidance, Masculinity/Femininity, Long versus Short-term orientation, and Indulgence versus Restraint (see Hofstede, 1997). However, Long versus Short term orientation and Indulgence versus Restraint dimensions are usually excluded from the framework as Hofstede does not provide sufficient theoretical and empirical claims regarding the influence of the two dimensions on education (Alnosiaan, 2018). Thus, in the integrative model, only the first four dimensions of national culture (power distance, individualism vs. collectivism, uncertainty avoidance and masculinity vs. femininity) are recommended to be considered in the analysis of the influence of culture on instructors' ICT use. Generally, ICT use is high in culture with low power distance (Al-Hujran & Al-dalahmeh, 2011), individualistic (Sánchez-Franco, Martínez-López & Martín-Velicia, 2009), low uncertainty avoidance (Leidner & Kayworth,2006) and femininity (Osman & Köhler, 2013). Ethiopian national culture is characterized by a high power distance, collectivism, masculinity and high avoidance of uncertainty (Yewondwosen, 2020). In such a context, there is less space to integrate ICT (see e.g., Aoki, 2010). However, the impact of culture on instructors' ICT use is not examined in developing countries such as Ethiopia.

Language *refers to* proficiency in the English language, which is a *de facto* language of technology (Grazzi & Vergara, 2012). This dominance of the English language in ICT means that ICT favors only the English language speakers. In Ethiopia, the use of foreign languages (e.g. English) is limited to schools, NGOs, and rarely in federal offices. In countries where the English language is not well understood (except for those who can adapt technology

to their own local language), the use of ICT is very limited (Ali, 2011) and Ethiopia is not an exception to this. Students and instructors in Ethiopian HE have a deficiency in their English language proficiency (Birbirso, 2014) that may hamper their ICT use.

Academic discipline

Academic discipline refers to a specific area of study, a branch of knowledge recognised by a certain distinctness it reveals in its content and methodology (Yadav & Lakshmi, 1995). Some academic disciplines such as SEM are perceived to be more suitable for ICT use than social sciences (Zubković et al., 2017). In our qualitative study mentioned above, the instructors perceive ICT uptake to vary across various academic disciplines because of their characteristics (see Ferede, Elen, Van Petegem, Hunde, & Goeman, 2021). While the finding of the above study indicates the potential of academic discipline in influencing instructors' ICT use, such studies need to be conducted on a large scale and supported with quantitative analysis in order to arrive at more conclusive findings.

Limitations of the model

The proposed integrative model has limitations in that all variables included in the empirical component except for ICT attitude were measured using a self-report questionnaire which means that they are prone to response and social desirability (Demetriou & Uzun, 2014) and common method (Karahanna & Agarwal, 2000) biases. Another limitation is that not every relationship (e.g. the bidirectional relationship between students and instructors' ICT use) hypothesized in the conceptual part of the proposed model is equally supported by empirical evidence.

Conclusion and direction for future studies

In this paper, an integrative model of instructors' ICT use that consists of determinants categorised under institution, instructors, students, technological attributes, culture and language, and academic discipline is proposed. In this model, a new perspective of ICT use determinants (e.g., the linkage between instructors' and students' ICT use is rarely discussed in the literature) is brought to the model in view of a holistic model with generic viability. The current integrative model can be taken as a good starting point to arrive at a model that is tailored to the context of HE in developing countries. The proposed integrative model is yet to be tested empirically in its totality. Researchers are, therefore, encouraged to test the proposed model based on representative samples. Finally, to address the limitations of self-reported data, future studies need to consider the use of actual data or multiple data collection methods such as observation and time-use diaries to triangulate with self-reported data.

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