

Analysing the Integration of Models of Technology Diffusion and Acceptance in Nigerian Higher Education

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Abstract: The use of technology in learning environments has produced a series of different theories and models about how technology is adopted, accepted and used. This paper attempts to show the relevance of combining the diffusion of innovation model (DIM) and a context-specific model of technology acceptance (TAM) to understanding the acceptance or rejection of educational technologies in Nigerian universities. Using empirical evidence, the analysis attempts to determine the extent to which the adoption, acceptance, and use of educational tools support or contradicts the components of the two models, emphasising how a range of technological, pedagogical, institutional, socio-cultural, and design-related factors informed, facilitated, and discouraged the diffusion, adoption, acceptance and use of blended eLearning systems in three Nigerian universities. The analysis suggests the ‘relevance’ and ‘limit’ of the determining components and identifiers of both models, arguing instead for a critical examination of the relationship between different models as to understanding the factors that might lead to the acceptance or rejection of technological innovation.


1 INTRODUCTION

The diffusion and adoption of eLearning systems, either through a blended approach or through online learning, has become a common approach to education in developed and developing countries. The assumption is that the adoption of technology brings about optimal ways to the practices of teaching, learning, and management of educational processes. However, the process and practice of transiting from traditional ways to education to a blended approach is one that has both positive and negative implications. The presumption is that technology is a transformative catalyst that can bring the old and the new together, and thus relevant to the renaissance of education in most developing countries (Gulati, 2008). Research has also pointed to how the mere transfer of innovation from developed to developing countries is not entirely a technological phenomenon, but rather a pedagogical, social, economic, and organisational agenda (Reagan, 2004). A range of frameworks for the adoption and implementation of blended learning are proposed (Graham et al., 2013;

Bervell and Umar, 2017). What might seem universal and relevant to a multitude of cultural contexts might however not be relevant to the decolonisation movement of education in Africa. This calls for a critical re-examination of how stereotypical models fit into such an educational context. The literature in the field of blended learning has also emphasized the requirement of examining the different factors that promote or hinder the adoption of technology (Castro, 2019). This raises the issue of considering how well-known models are relevant to the socio-cultural context and pedagogical needs of Nigerian higher education institutions.

With the perceived differences between developed and developing countries, the understanding of the socio-economic and contextual conditioning of different institutions and users (Tarhini et al., 2017), becomes important for integrating a range of learning models to determine the institutional, pedagogical, organisational, social and technological factors that influence and shape the adoption and acceptance of a blended approach to education (Marangunić and Granić, 2015; Okocha, 2019). This paper focusses on examining how the

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diffusion and acceptance models can take into account the peculiarity and specificity of the Nigerian context. It seeks to understand the different factors that support and promote or discourage the adoption of a blended approach and the acceptance of eLearning systems in three Nigerian universities. We examine differences in pedagogical needs, educational and social background, institutional structures and policies, socio-economic relations, and technological capabilities in the different institutions. Consequently, the question that we seek to examine is whether the integration of diffusion of innovation and technology acceptance model can provide a better understanding of the factors that should be championed for a blended approach to teaching/learning in Nigerian universities?

2 THEORETICAL CONTEXT

The notion of technology adoption and acceptance has become a common phenomenon in studies relating to the field of information system, education technology, and human-computer interaction (HCI). Different models have identified a range of factors that assist in predicting and facilitating the diffusion, adoption, acceptance and use of technology in a variety of social and organisational context. The more common is the technology acceptance model (Venkatesh and Davis, 2000) and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003). These models point to the importance of user's attitude and intention towards the adoption, acceptance and use of technology. The models provide a range of variables that allows understanding the factors that support or hinder the perception of using technology. However, most of the studies in the literature report of findings from developed countries, suggesting indicators primarily relevant to industrialised social settings (Marangunic and Granic, 2015).

However, within the context of developing countries, there has been a surge of studies that examine how socioeconomic and cultural factors might influence the acceptance and adoption of technology (Musa, 2006). The general premise for most of the models has been about the availability of technology and that the determining factor is the end-user. In situations where the availability of technology is scarce and where other external factors are readily influential, the applicability of TAM and its extended models are put to the test (Boateng et al., 2016). Although the revised models have proven useful to outlining how differences in capacities

(accessibility and exposure to technology) and values (socio-economic, contextual, cultural, political factors) might provide insights that could bring about understanding the behavioural intention and attitude toward use (Olatubosun et al., 2015; Nicholas-Omoregbe et al., 2017; Okocha, 2019), a deeper understanding of the determinants influencing and shaping the adoption and acceptance of eLearning systems are scarce.

What is missing in the literature of education technology is the analysis of how context-specific factors might have warranted the diffusion of technology in education. There is a limited account of the identifying factors (socio-cultural and contextual) that have supported or hindered the acceptance of available eLearning systems by lecturers and students. Most of the attention has been given to the primary components of the TAM models, specifically the relevance of perceived usefulness and perceived ease of use, rather than on how usage can be maintained and promoted (Turner et al., 2010). Less attention has also been given to the institutional, pedagogical, socio-cultural, contextual, and design-related factors that might have facilitated the continual acceptance of blended approach to teaching/learning in Nigeria; or the factors that might have warranted the lack of acceptance and use by students and lecturers. Within the gaps identified, we sought to determine the extent to which the diffusion of innovation and technology acceptance models support the analysis of factors that came out of our review of the present landscape of blended learning in three Nigerian universities and the study of the work practice of software designers/developers. Such a report provides a broader picture of the link between the factors that necessitate adoption, design strategies that influence the acceptance or rejection of specific educational tools, and factors that could shape current and future use.

2.1 Technology Acceptance Models

The TAM is considered as the most well-known and adopted model for determining the perception, attitude and behavioural intention to accept or reject technology. Its core component includes the *perceived usefulness* (PU), *perceived ease of use* (PEOU), *attitude towards use* (AT), *behavioural intention to use* (BI), and *actual use* (AU) (Davis et al., 1989). It has proven useful to the prediction of 30-70% usage of technology. The model has been adopted, extended and used in a range of social context. Examples of which are the TAM2 (Venkatesh and Davis, 2000), UTAUT (Venkatesh et

al., 2003; Venkatesh, et al., 2012), and DeLone and McLean's success model (DeLone and McLean, 2003).

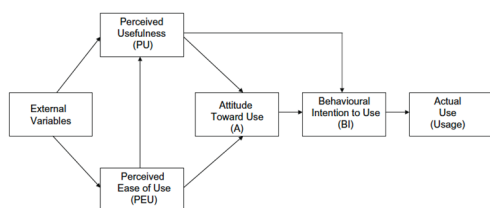


Figure1: The original technology acceptance model.

Such models outline the consideration of factors like perceive usefulness, perceived ease of use, perceived ubiquity, performance and effect expectancy, innovativeness of the technology, subjective norms, social influence and contextual determinant (facilitating conditions) of the technology as factors that might suggest the determinant towards the intention of accepting or rejecting technology. However, some argue that the level of prediction of usage might be more subjected to behavioural intention than perceived usefulness and ease of use (Turner et al., 2010)

Within the Nigerian context, these models were adopted in analysing a range of factors that predict the adoption and acceptance of eLearning systems (Olatubosun et al., 2015; Nicholas-Omoregbe et al., 2017; Okocha et al., 2017; Yakubu and Dasuki, 2019; Okocha, 2019). However, even with its usefulness, the extension of TAM and UTAUT has proven difficult in examining a range of other factors, specifically socio-cultural and contextual factors that might have influenced the adoption or rejection of technology (Legris et al., 2003). Others have examined a three-dimensional view of evaluating the adoption and acceptance of eLearning system through the analysis of the different phase of use, the users involved and the components at each stage (Persico et al., 2014). Most of the studies not provided sufficient indicators for determining the implications of both the characteristics of the innovation and the adopter to the pedagogical processes and learning activities. We focus on the aspect of the tool that could predict the level of adoption and use.

2.2 Diffusion of Innovation Model

As technology has penetrated every facet of our life, our perception of adopting or rejecting an innovation might be based on our belief of the importance and relevance of the innovation to some aspect of our life. With the prevalence of tools developed and often not adopted, the diffusion of innovation model came

about as to provide a unified theory of diffusion. The model integrates the innovation-decision processes, the individual's innovativeness, the rate of adoption and the perceived attitude of the potential adopter towards the innovation in determining the acceptability or rejection of an innovation (Rogers, 2010). In determining the level of diffusion of technology in an organisation, the adopter uses a range of construct to facilitate or impede their perception and attitude towards acceptance/rejection (Moore and Benbasat, 1991). The constructs include the *relative advantage* of using an innovation against previously used tools; the *visibility* of seeing others adopt the same tool; the *compatibility* of the tool to one's prior experience and values; the tangible outcome of adopting the tool (*demonstration*); and the perceived acceptability of planned used (*trialability*) (Rogers, 2010). What the model offers is an understanding of the decision processes involved (and the factors that shape one's decision) and the characteristic of the innovation towards the reduction of uncertainty (in the perception of potential adopters) of acceptance or rejection. The components provide insights into the rate at which a particular tool could be accepted or rejected within an organisational context, thereby having a lesser prediction power (Sahin, 2006).

However, as Sahin noted, the model has shown greater relevance in understanding factors that facilitate or impede the adoption of technology in higher education. It also outlines the characteristic (of both the innovation and the adopter) that influence the decision process, the rate of adoption and the perceived behaviour and attitude of an adopter. This is relevant to our analysis as it provides a means for identifying what necessitates the decision to adopt a blended approach, the design strategies that led to certain attributes of the innovation, and the institutional implementation mechanisms that have supported the transition from conventional methods to a blended approach.

2.3 Integration of TAM and DIM

While a lot of studies have attempted to identify and determine a range of factors that support/hinder the adoption and acceptance of technological innovation, there appears to be a varied interpretation and extension of existing models in the analysis of eLearning systems. A range of studies have examined how different factors, such as self-efficacy, performance and effect expectancy, social influence, quality of service, subjective norms, interaction, and satisfaction might provide determinant insights into

user's perception and intention for accepting and using an eLearning system (Persico et al., 2014; Rahmi et al., 2018). Others have pointed to the implication of integrating different models in determining the intention and attitude towards adopting and accepting technology (Marangunić and Granić, 2015), and specific to the context of Nigerian (Nicholas-Omoregbe et al., 2017). Consequently, the integration of different models, specially TAM and DIM have shown significant influence in understanding the factors that drive or hinder acceptance (Persico et al., 2014; Tshabalala et al., 2014; Al-Rahmi et al., 2019). Lee and colleagues (2011) attempted to integrate the TAM and DIM as to determine the relationship between motivation and determinants of various factors to the adoption of a blended approach and the acceptance of eLearning systems. Al-Rahmi and colleagues (2019) report on how the integration of TAM and DIM can assist in developing insights that would inform the decisions of planning, implementing and evaluating the use of eLearning systems. What these studies have shown is that TAM and DIM complement each other, and their integration provides insights that would determine the level of acceptance and rejection of an innovation.

However, within the context of sub-Saharan Africa, Bervell and Umar (2017) analysis points to the lack of integration of different models to determine the factors that might have promoted or hindered the adoption and acceptance of eLearning systems. Most studies adopt and extend the TAM, with only a few utilizing the integration of both TAM and DIM in their analysis (for example, Tshabalala et al., 2014). Most studies focus on the perspective of end-users (lecturers and students), neglecting the perspective of educational managers and software designers/developers in the analysis of the factors that motivate, inform, facilitate, or impede adoption/acceptance. With the perceived differences between developed and developing countries and the understanding of the socio-economic and contextual conditioning of different communities, it becomes important integrating a range of models to determine the different factors that might have necessitated the adoption of technology in education and the attributes that might have led to the acceptance/rejection of blended eLearning systems in most Nigerian universities. As we analyse data collected from a range of actors, the factors that facilitate or impede adoption and acceptance might vary, and what we sought to point to is how a range of institutional, pedagogical and technological factors shape the diffusion of technology in Nigerian higher education. We also identify design related and adopter related

factors that might have led to the acceptance or rejection of the eLearning system like Moodle, google classroom, canvass, and blackboard to support the processes and activities of teaching/ learning.

3 EVALUATIVE APPROACH

The purpose of the study was to determine the extent to which different components and identifiers of the models of technology diffusion and acceptance provide a better understanding of the factors that might have led to the acceptance or rejection of educational technologies within the context of Nigerian Higher education. Qualitative data – interviews and focus group discussion – was collected across three universities and three education technology companies in Nigeria. Both the author's institution and the host institutions/companies granted ethical approval. Different forms of reflexivity and relational accountability was practised, before, during and after the fieldwork, mainly due to the political implications of the field researcher's positionality as an in-outsider (Nigerian).

In responding to the gaps identified in the literature considering the lack of qualitative evidence in the analysis of the factors that foster or impeded the acceptance/rejection of technological innovation, qualitative data was collected from both public (2) and private (1) universities, and educational technology companies (3). All of the three universities might be considered at an exploration–adoption stage (early implementation), mainly because only a few departments and people adopt and accept the technologies diffused into the educational practice of their institution. Whereas the three companies might be considered techno-educational driven and with a wider client base. The data collected and considered in the analysis consisted of five focus group discussions with twenty-nine students, fourteen interviews with lecturers, and three interviews with education managers across the three universities. Also, seven interviews from software designers/developers across the three companies were considered in the analysis. As the data that informs the analysis is part of a project concerned with decoding and untangling the thread of postcolonialism in the process and practice of using technology in Nigerian higher education, we adopted an existing grounded approach to thematic analysis where relational extracts that support or contradict the components of both the TAM and DIM models are highlighted and mapped to the issue problematised in

this paper. It is our belief that the collective data from a range of stakeholders would adequately show how the integration of the two models might provide insights into a range of factors that might have motivated, informed, facilitated or discouraged acceptance/rejection of educational technologies. From the pool of the data considered, we attempted to identify other relevant and context-specific factors that might have impacted on the level of adoption, acceptance, or rejection of eLearning systems. These factors are important as we not only focus on the end-user, as widely reported in the literature, but also on those that design and evaluate the tools deployed, and those that decide on which technological innovation to incorporate into the educational practice. To re-emphasise, our evaluative approach seeks to focus on bringing forth an understanding of specific indicators and strategies that can be considered peculiar to the Nigerian context (but might also be relevant to other developing countries).

4 RESULTS

In this section, we present the findings from the evaluative analysis of participants' data; presenting an understanding of the factors that promote and impede the practices of a blended approach. We emphasize on the perspective of education managers and software developers/designers, thereby providing a new approach to that was normally adopted in the education technology adoption and acceptance literature.

4.1 Rationale for Diffusion and Adoption of Technology

From the analysis of the data from educational managers, it is evident that the factors that motivate the adoption of a blended approach to education are driven by a pedagogical necessity, an organisational culture, a socio-cultural demand and a technological opportunity. Organisationally, the motive for blending within the private university is mainly because of the aim to provide 'British standard education in Nigeria'. The assumption is that leveraging technology can bring about an effective means for "providing quality educational services, streamline operational processes, reduce operational cost, and improve transparency" (Admin 1). There are also ideas about how different organisational structures and strategies, management frameworks and support systems might have supported the motive for blending. The strategies include an analysis of the

practices of a range of institutions globally that implemented the blended approach, what model's they adopted, the sort of mechanisms put in place for change management and mitigation of risk, and an examination of how relevant that might be to the Nigerian context. There are also ideas about how the institutional policy of identifying potential avenues where their instructional practices can be improved through the use of technology might have supported the adoption of a blended approach. socio-culturally, the participants identify a range of factors that have had some significant impact on the decision to blend. This includes; the societal attitude of people towards the advancement of technology globally (mostly mobiles), the availability and accessibility of mobile technologies among a range of users, the need for flexibility and autonomy in educational processes and practices, and also the need for a quantifiable value for the money paid for education.

Although one might expect of a university that strives to provide 'standard' British education that it would be technically well equipped, the shared understanding of the pedagogical needs of most students/lecturers still warranted the adoption of a blended approach. Some preferred conventional means of education (through human interaction and dialogue); others preferred the online form of learning, therefore placing a pedagogical and a socio-cultural requirement for an approach that is relational to the needs of different people. Such an approach responds to the educational needs of various people but also moves towards developing students' technical, employability and entrepreneurship skills. It also supports understanding students' performance over time, identifying where one needs support and thus might increase retention rates and reduce attrition rates of students. Equally relevant is that to facilitate the adoption of a blended approach, the institutional diffusion model emphasizes the design of implementation mechanisms that provides the necessary support for transition and change management. This is achieved through the processes of awareness creation, training of lecturers, and incentivising and championing uptake for both students and lecturers. This has drastically popularised the enthusiasm for a blended approach.

For public universities, the organisational motive for a blended approach was mainly because of a pedagogical policy and a socio-cultural demand for flexibility among a range of stakeholders. By pedagogical policy, we mean to suggest, as highlighted by a participant that "with the level of development in the country, the classic online learning is classically not suitable for us. We are in a

system where people are transiting, and people tend to hold certain things that are part of the past.....we still want to have some form of human element because it doesn't tie down with our African background and context.....we believe that it is not everybody that has the same orientation towards learning, so we provide them with a platform whereby they can identify what they are more attune to....the blended approach is the focus” (Admin 2). This is a pedagogical and a socio-cultural requirement placed on most public universities. What the data suggest is that traditional methods of education are not in line with the institutional vision of becoming global and also not contextually relevant to the needs of most community members. The general assumption is that the blended approach is appropriate to the established guidance laid out by the relevant regulatory agencies. What is common among the public universities is that there is a determination to adopt best practices, and leverage on technological development, as it would encourage institutions to compete locally and globally. As the proliferation of technology has shown how educational processes and practices can be supported and enhanced by technology, the prediction is that the blended approach would eventually become the practice of the day. This places universities in the position of competing towards becoming a key promoter of the blended approach.

Although the public universities might be facing issues concerning lack of funding, infrastructure deficit, the higher number of students, limited accessibility to resource, and effect irregularities and lack of enforcement mechanism, there are relatively few institutional implementation mechanisms in place that promote the blended approach to a range of stakeholders. These mechanisms include budgetary provision for equipment's, staff training, and policy directions. What is not in place is an effective change management strategy that could inform the processes of promoting and incentivising the adoption of a blended approach. In a nutshell, what the analysis might suggest, for both public and private universities is that the blended approach is widely considered to be the future of education in Nigeria. It also shows how a range of constructs – organisational, pedagogical, socio-cultural, contextual, and technological – have shaped, promoted, and popularised the adoption of a blended approach. These constructs are relational to the attributes of the diffusion model, in particular, they point to different characteristics of the social and organisational context where the technology is deployed, the different actors involved, and the contextual factors that shape the decision to blend or not. These

‘determining insights’ popularise the blended approach. From the analysis, a pedagogical necessity, an organisational culture, a socio-cultural demand, and a socio-economic opportunity are to be considered as supportive components to DIM’s decision processes and attributes of innovation. Other factors like awareness creation, incentivisation, and the development of relevant change management strategies and support systems are relational to factors that can increase the adoption rate. It is our position that the factors identified have shown an active link to the process of developing an effective institutional action plan guiding the decision processes that would frame the implementation of eLearning systems in a blended educational context.

4.2 Effective and Ineffective Design Strategies

As we are after identifiers that could predict and influence/discourage the level of acceptance and usage of eLearning systems (either for new users or for continual use by existing users), both effective and ineffective strategies are identified. From the analysis, the effective design strategies that we understood to have had significant implications on the acceptance and use of educational tools include the methods used in understanding user requirement, the design and development framework that inform the design processes, the level of user engagement in key design decisions and evaluations, and the responsiveness and sensitivity of the design (in term of different user values and other socio-cultural needs). These are higher-level identifiers that inform the practices of developing educational tools that the data suggests hold more significant implication to the processes and activities both students and lecturers can undertake. There are also low level, and equally relevant, identifiers like the tool’s level of integration with existing user systems; the compatibility of the tool to a range of devices; the usability, user-friendliness and simplicity (or customisation to the university context) of the tool; and the quality, performance and security of the tool. Most of these identifiers determine the level of user’s interaction, engagement and satisfaction while using the tool. They also influence the user’s perception of a tool, determine their behavioural intention and attitude towards use and thus critical to the acceptance or rejection of technology.

There are other factors that, even though the participants might not admit are ineffective practices, might jeopardise the acceptance of deployed educational tools. We believe that these factors

significantly promote the rejection of educational tools. Most of the inefficient practices, which all participants suggested, are warranted by the contextual nature of the Nigerian software industry. Although they have attempted to show how they adhere to best software engineering practice, irregularities are often normalised. This include designer/developers neglecting potential user's requirement – we 'put ourselves in the shoes of the use' (Dev4), 'thinking for them' (Dev3), 'implement something close to what we think is generic'(Dev2) – assuming that designerly way of knowing (Cross, 2001) is the same as a userly way of knowing. There is also the alarming issue of how educational managers providing system requirements, engage in evaluating and validating educational tools, thereby considering themselves de factor users. Although they are potential users (their use of the technology is mainly to manage the administrative and educational processes of higher institutions) they do not engage with the educational tools to carry out some teaching/learning activities. One might expect that a set of actual users' (or potential users) will be involved in articulating their needs, and some developed educational theory or framework inform the design processes of a particular tool. However, what the data suggests is that no pedagogical requirement nor actual user requirements inform the design strategies used to develop and deploy tools. It seems more likely that tools are developed and implemented with the simple expectation that the users will find them useful and relevant to their processes, and which therefore from our analysis, might have led to the low acceptance rate.

However, from the analysis of developers/designers, one can appreciate what their perspective might suggest to the predictability and articulation of end user's attitude and behavioural intention towards the use of eLearning systems. It is therefore important to point out that although the literature might have neglected the perspective of designers/developers, as our analysis has shown, they hold significant implications to the acceptability or rejection of educational tools, in both private and public universities. Their practices can either promote or impede the processes of teaching and the learning outcome, and thus ought to form part of any model that examines the acceptance or rejection of educational technologies.

4.3 Identifiers of Acceptance and Use

In this section, we focus primarily on factors that might have promoted or discouraged the acceptance

of the adopted tools by lecturers and students. The analysis attempts to show the different and conflicting factors that have fostered/hindered the acceptance and use of eLearning systems as part of educational processes and activities. It also identifies factors that can bring about continual use or shape future use.

Lecturers' Perspectives. For lecturers, the most prominent factors that have led to acceptance are individual curiosity, pedagogical necessity, social accessibility, availability of technology, and institutional promotional strategies and policy directions. This is also driven by the assumption that necessary infrastructure and technical training is readily available, while also having sustainable enforcement mechanisms in place. These factors appear more strongly from the narratives of the members of the private university. In public universities, however, it is mainly due to personal drive, social influences, and an awareness of the relevance of the adopted technologies. Equally relevant are the factors that might have warranted the lack of acceptance by other lecturers. These factors include people's general orientation towards technology, lack of proper promotional strategy and enforcement policies, inadequate training and support, lack of awareness of the importance of available tools, and the dynamics of people's attitude and behaviour towards change. These issues are institutional, whereas other national factors like limited necessary infrastructure and connectivity might have had hindered the acceptance of educational tools in most higher institutions. In a lecturers' words: "the issue of using electronic mediated means to reach out to students from the part of the lecturers is because some people are conservative and not ready to change. They still feel that the only way students can learn is when they see you standing in front of them. But some of use that has undergone some training have come to learn that students learn better when the enabling environment is provided" (Lect 11). Such an account suggests a profoundly rooted mentality towards conventional approaches to education, and which the blended approach supports.

Students' Perspectives. For students, the analysis attempt to identify specific characteristics of the educational technologies that encouraged use. We also identify other factors, either technology-related or context related that might have discouraged use. In the private university, students are more appreciative of the technologies diffused into their everyday practice, either through the use of education

technologies or through the use of innovative support systems. This is not to suggest that students of most public universities are dissatisfied with the technologies adopted in their institutions – but to highlight how the issue of the higher number of students and limited resources have led to negative behavioural attitude towards educational technologies. In both universities, students expressed their attitudes towards the tools adopted by suggesting that they are ‘easy in all aspect, interesting, user-friendly (student made an emphasis), straightforward, responsive, interactive, convenient and available’. These terminologies were used to show their perceived experience of use, providing insights into the characteristics of technology that warranted such behavioural attitudes. However, another group emphasised that “the technology does not really aid or have a significant impact on performance; it is just a way of disseminating learning materials and information” (Fgroup 2). Also, one of the important factors that might have fostered acceptance is that students are compelled to use the educational tools deployed in their various institutions, regardless of their perception or attitude towards what was deployed. This makes prediction relatively tricky, as they are in no position to decide whether to use or not, use is a necessity placed on them by their lecturers. Comparatively, this shows a clear correlation to TAM’s perceived usefulness and ease of use, but more importantly, how their lecturers and other institutional instruments and power’s drive their intention and attitude towards use.

Lecturers and Students as End-user’s. From the analysis of end user’s – both students and lecturers – one can infer two key indicators that shape current and future use: the institutional driver’s that promote acceptance by lecturers and the technologies characteristics that provide predictable insights into the compelling factors that drive continual use. The factor that standouts among all students are the ‘user-friendliness’ and ‘integrativeness’ of the tool with existing systems in place. In addition, to bring about more acceptance and actual use, there is a general agreement towards universal access (providing institutional loan schemes), promotion and awareness creation (through seminars, workshops, training, incentives), and the development of sustainable policies and context-specific actions plans towards changes management. This could bring about reorienting the perception and attitude of the academic community towards the blended approach, which will, therefore, shape present and future use. However, the analysis has also point to the fact that

the adoption and acceptance of educational tools by end users is not entirely based on relative attitude, perception or behavioural intentions of adopter, but also supported by salient arguments concerning institutional powers towards the subjective governance of adopters. The form of governmentality would be in how lecturers are under the disciplinary gaze of university managers, whereas students are constantly under the control of lecturer’s, thereby presenting end user’s as subjects that power is exercised upon. As the adoption of educational technologies are prescribed and enforced on end user’s, the subjectivity of the subjects of postcolonial education are limited in their ethical form of self-reasoning, self-formation, and self-governance.

5 DISCUSSION AND CONCLUSION

This position paper advances our understanding of how particular models and frameworks might inform the process and practice of adopting and using educational technologies in Nigerian higher education through a blended approach. It suggests that the integration of the components of the diffusion of innovation and technology acceptance model provide a better appreciation of the factors that might champion or discourage the adoption and acceptance of a blended approach to teaching/learning. From the analysis of those that decide on what to blend and how to blend, those that design and develop the tools used to support the blended approach, and those that get to use the tools in their processes and activities, our interpretive analysis has advanced a range of context-specific factors. First, the analysis emphasises prior findings concerning the relevance of the components of both models (Lee et al., 2011; Persico et al., 2014; Tshabalala et al., 2014; Al-Rahmi et al., 2019) by identifying and outlining factors that motivate, promote, popularise, and hinder the blended approaches to education, and then emphasising how the characteristic of both approaches provide insight into the possible acceptance or rejection of innovation. These findings are consistent with prior results from a range of studies that emphasise the implication of factors like; perceived ease of use, user-friendliness and technological integrativeness (Rahmi et al., 2018; Yakubu and Dasuki, 2019); the social availability-accessibility and innovativeness of technology (Okocha et al., 2017); the implications of subjective and social influences towards minimal uncertainty (Tarhini et al., 2017; Papadakin, 2018);

and the pedagogical relevance and associated importance of adoption, acceptance and use (Olatubosun et al., 2015; Nicholas-Omoregbe et al., 2017; Okocha, 2019). Some of the determining factors identified can be considered specific to the institution investigated, however, they might be generalizable to similar educational context.

Secondly, our analysis indicates how institutional mechanisms and strategies, like effective change management planning, timely staff training and support programmes, wider awareness creation strategies, and promotional incentivisation of use, can lead to an increase in adoption and acceptance rates. Our account points to significant and often taken for granted, factors that determine the extent to which technological tools can be integrated into conventional practices of higher education in developing countries. Such factors provide the basis for developing future actions plans and design implementation strategies that could support and promote future blending across different (Nigerian) universities. The factors are not merely technological, nor exclusively related to the characteristic of the adopter, but more to the broader cultural sociality of the context of deployment. This suggests the limits of the determining components of both models by bringing forth other relevant factors that might inform the deeper analysis of technology in Nigerian higher education.

Thirdly, the analysis points to how specific design-based identifiers could influence/discourage the attitude and behavioural intention of adopters. From the discussion of effective and ineffective design strategies, it can be inferred that the design approach adopted shapes how the tool gets developed and evaluated and thereby influences current and future acceptance or rejection. We suggest that the major contribution of our analysis is to point to how differences in an organisational context, pedagogical culture, and individual users' positionality can identify the factors that promote or discourage acceptance and use.

To conclude, the analysis informs our understanding of the dichotomy between theory/theoretical construct and the practical application and relevance of stereotypical models and frameworks that impact the acceptability and rejection of any technological innovation. In practice, the range of factors identified from educational managers, designers-developers, and end users provide a means of outlining how the plurality of pedagogical, organisational, socio-cultural, and technological identifiers are interpreted and translated into design. We have also shown how

design related identifiers might influence or impede the acceptability and usability of educational tools, raising important question regarding the politics of 'design' as exemplified in HCI. The insights that came from the analysis of a range of stakeholders; and the implications of the mundane practices of thinking, reasoning, deciding, designing, and deploying technological innovation, suggest some of the power relations involved in deploying technology in education, in Nigeria (and elsewhere). This further indicates the power dynamics of dominant paradigms in educational research, where technology is often considered neutral and beneficial to the renaissance of education in developing countries. A critical and subtle analysis of the underlying premise surrounding such an assumption might provide insights into how ethnocentric ideologies and prescriptive models shape the adoption of technological innovation in Nigerian higher education. This, therefore, necessitates the consideration of indigenous and localised alternatives that are not generalizable and prescriptive, but rather generative and emerging. Through a Freirean and Foucauldian concepts about 'problematization', 'governmentality', and 'ethical subjectivity' (Deacon, 2006; Bacchi, 2012), future work would attempt to show how dominant paradigms in educational research and HCI might have produced a fateful misunderstanding and misrepresentation of the factors that drive and popularise the adoption and acceptance of educational technologies in developing countries.

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REFERENCES

- Al-Rahmi, W. M., Yahaya, N., Alamri, M. M., Alyoussef, I. Y., Al-Rahmi, A. M., & Kamin, Y. B. (2019). Integrating innovation diffusion theory with technology acceptance model: supporting students' attitude towards using a massive open online courses (MOOCs) systems. *Interactive Learning Environments*, 1-13.
- Bacchi, C. (2012). Why study problematizations? Making politics visible. *Open journal of political science*, 2(01), 1.

- Bervell, B., & Umar, I. N. (2017). A decade of LMS acceptance and adoption research in Sub-Saharan African higher education: A systematic review of models, methodologies, milestones and main challenges. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(11), 7269-7286.
- Boateng, R., Mbrokroh, A. S., Boateng, L., Senyo, P. K., & Ansong, E. (2016). Determinants of e-learning adoption among students of developing countries. *The International Journal of Information and Learning Technology*, 33(4), 248-262.
- Castro, R. (2019). Blended learning in higher education: Trends and capabilities. *Education and Information Technologies*, 24(4), 2523-2546.
- Cross, N. (2001). Designerly ways of knowing: Design discipline versus design science. *Design issues*, 17(3), 49-55.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8), 982-1003.
- Deacon, R. (2006). Michel Foucault on education: a preliminary theoretical overview. *South African Journal of Education*, 26(2), 177-187.
- Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*, 19(4), 9-30.
- Graham, C. R., Woodfield, W., & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *The internet & higher education*, 18, 4-14.
- Gulati, S. (2008). Technology-enhanced learning in developing nations: A review. *The International Review of Research in Open and Distributed Learning*, 9(1).
- Lee, Y. H., Hsieh, Y. C., & Hsu, C. N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Journal of Educational Technology & Society*, 14(4), 124-137.
- Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & management*, 40(3), 191-204.
- Marangunić, N., & Granić, A. (2015). Technology acceptance model: a literature review from 1986 to 2013. *Universal Access in the Information Society*, 14(1), 81-95.
- Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, 2(3), 192-222.
- Musa, P. F. (2006). Making a case for modifying the technology acceptance model to account for limited accessibility in developing countries. *Information technology for development*, 12(3), 213-224.
- Nicholas-Omoregbe, O. S., Azeta, A. A., Chiazor, I. A., & Omoregbe, N. (2017). Predicting the adoption of e-learning management system: A case of selected private universities in Nigeria. *Turkish Online Journal of Distance Education*, 18(2), 106-121.
- Okocha, F. (2019). Acceptance of Blended Learning in a Developing Country: The Role of Learning Styles. *Library Philosophy and Practice*.
- Okocha, F., Eyiolorunsho, T. A., & Oguntayo, S. A. (2017). Student Acceptance of Blended Learning in Nigeria: A Case Study of landmark University Students. *Advances in Multidisciplinary and Scientific Research*, 3(1).
- Olatubosun, O., Olusoga, F. A., & Samuel, O. A. (2015). Adoption of eLearning technology in Nigerian tertiary institution of learning. *Current Journal of Applied Science and Technology*, 1-15.
- Papadakis, S. (2018). Evaluating pre-service teachers' acceptance of mobile devices with regards to their age and gender: a case study in Greece. *IJMLO*, 12(4), 336-352.
- Persico, D., Manca, S., & Pozzi, F. (2014). Adapting the technology acceptance model to evaluate the innovative potential of e-learning systems. *Computers in Human Behavior*, 30, 614-622.
- Rahmi, B. A. K. I., Birgoren, B., & Aktepe, A. (2018). A Meta-Analysis of Factors Affecting Perceived Usefulness and Perceived Ease of Use in The Adoption of E-Learning Systems. *Turkish Online Journal of Distance Education*, 19(4), 4-42
- Reagan, T. G. (2004). Non-western educational traditions: Alternative approaches to educational thought and practice. Routledge.
- Rogers, E. M. (2010). *Diffusion of innovations*. Simon and Schuster.
- Sahin, I. (2006). Detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *TOJET*, 5(2), 14-23.
- Tarhini, A., Masa'deh, R. E., Al-Busaidi, K. A., Mohammed, A. B., & Maqableh, M. (2017). Factors influencing students' adoption of e-learning: a structural equation modeling approach. *Journal of International Education in Business*, 10(2), 164-182.
- Tshabalala, M., Ndeya-Ndereya, C., & van der Merwe, T. (2014). Implementing Blended Learning at a Developing University: Obstacles in the Way. *Electronic Journal of e-Learning*, 12(1), 101-110.
- Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature reviews. *Information and software technology*, 52(5), 463-479
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, 46(2), 186-204.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
- Yakubu, M. N., & Dasuki, S. I. (2019). Factors affecting the adoption of e-learning technologies among higher education students in Nigeria: A structural equation modelling approach. *Information Development*, 35(3), 492-502.