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A Model for Promoting Lifelong Learning Education Using Mobile Learning Technology among People in Developing Countries: A Case Study of Uganda

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Abstract: *Lifelong learning (LLL) has become one of the key aspects for people to address global changes and personal real-world problems encountered in various avenues of life such as the labor market, politics, education, technology, and others. Despite the overwhelming potential embedded in the LLL paradigm such as boosting personal development, competence and self-sustainability, social inclusion, and professional development, its promotion and access to people is still a big challenge in developing countries. However, high mobile technology infiltration, together with the explosion of mobile learning (ML) applications among people has the potential to make it possible for people to access LLL materials for survival purposes on the go. In this light, the paper contributes to the ongoing research by designing a model for promoting lifelong learning education using mobile learning technology among people in developing countries. This study adopted the Human-centered design (HCD) approach, which emphasizes complete user involvement throughout the stages of solution design. The model as a key result of the paper covers key constraints that are required for successful access to LLL on goes. These constraints included but were not limited to; facilitating individual and group learning styles, designing for support of different content formats and edutech tools, designing for user learning experience, and identifying areas of preference for LLL, among others. The study recommends more investigations about identifying the worthiness of participating in learning in unconventional, informal, or everyday contexts and more research on various LLL theories and their benefits in LLL.*

Keywords: *Lifelong learning, Lifelong learning pedagogies, Mobile learning models, Human virtual learning environment*

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1. Introduction

The world is shifting everywhere for people in such a way that without people's endeavors to carry on to growth, they will soon be behind schedule (Rowell et al., 2020). In the 21st century, people are required to be self-initiated learners (Prasanna, 2019). People need to constantly have their skills sharp and current to have control in all they do and practice (Prasanna, 2019). Furthermore, all people have accepted the desire to learn as a way to adjust to dynamics, elevating and satisfying their way of living (Reddy, 2017). Pressures behind lifelong learning include factors to sustain competitiveness and readiness to encounter future prerequisites (Rowell et al., 2020). It is

stated that these pressures are caused by dynamics such as trending kills/technologies, prominence on self-sustainability, and financial progressions (Dede & Richards, 2020; Ashford & Hall, 2011). However, for potential lifelong learners to overcome these pressures, they should possess control over where, when, what, and how to learn (Kang & Lin, 2019). New technology-supported training concepts to support this learning require validation through user testing and evaluation as stated by Schulz et al., (2017). This applies also to mobile learning technology-based training tools which are concerned with acquiring skills and competency development on the go.

Globalization and the progression of fast-changing knowledge economies have caused a need for people to keep on upgrading their skills throughout their lives to cope with the above-mentioned changing avenues of life, both in their work and private lives (Ogden, 2010). The ability to learn and adapt to the required new skills and knowledge is paramount (Hanemann, 2015). Due to this, lifelong learning (LLL) comes to the rescue, because it encompasses avenues for learning these skills in this 4th industrial revolution era. The globalization and growth of the fast-changing knowledge economies require people to keep on flexibly improving their skills and competencies (Merriam & Baumgartner, 2020). This improvement of skills and competencies is fostered for employability and self-sustainability throughout the lifetime of people without necessarily going back to formal education (Merriam & Baumgartner, 2020; Gulin & Uskov, 2017).

As this shift of LLL quickly gains economic, educational, social, and political recognition, countries have opted to use mobile virtual universities as an attempt to try to confront the shift (Barker, 2020; Longworth, 2003). However, this option only caters to formal instructional learning ignoring the aspect of LLL which considers events people get engaged in, across their lifetime to enhance their skills and competencies for employability and personal needs (Davies, Diemand-Yauman & van Dam, 2019; Aspin & Chapman, 2007). It is worth noting that LLL should proceed in a lifetime independent of location as stated by Rojvithee (2005). During <5 ages, some essential learning proceeds to avail a basis for forthcoming habits of learning as well as aptitudes, for the ages of 6 to 24 age, learning proceeds in some formal instructive institutions such as kindergarten schools, high schools, and universities. Significant parties such as media, spiritual organizations, households, and community groups play an important part during this particular period of learning. However, from 25 to 60 ages, learning proceeds informally by applying instructive media form of avenues such as work venues, jobs, coworkers, on the road, technologies, and surroundings. These learning trails consequently mean that people are bound to constant advancement of their intelligence, skills, and competence along with honesty. Lastly, people aged 60 and above years are elderly and only learn right from doing what is appropriate to their age bracket including but not limited to fine art, song composition, as well as athletics.

Though various efforts and research have been put forward for initiating mobile learning (ML) projects like those in universities like Athabasca University (Canada), Open University (UK), and Tanzania, models like Design Requirement Model by Parsons (2007), M-learning Adoption Model by Barker, Krull & Mallinson (2005) among others, the key challenge with these efforts is that they are not tailored for supporting the component of LLL content and objectives. Additionally, they exhibit a lack of sufficient ability to the connection of formal education to the real world (Johnson, 2016).

Moreover, Do et al. (2021) conducted the first systematic scientific investigation of the literature on lifelong learning although the selected studies focused only on the Southeast Asia context. Because the researchers used bibliometric analysis, it was not possible to study the intricacies of a lifelong learning issue, evaluate the quality of each scientific paper, or accurately highlight its effects on the topic. To overcome these limitations and provide a more general overview of the research topic, another systematic review of lifelong learning literature must be conducted. Hence, the objective of this study was to develop a model that is based on ML technologies and their affordances to promote LLL among people for self-sustainability and employability. The research study was guided by the research question:

What model is suitable for promoting lifelong learning using mobile learning technology?

The rest of the paper is organized as follows: the next section (2) highlights the relevant literature about the subject under investigation. Section 3 gives the methodology of study. Results and discussion, and conclusion and recommendations of the study are described in sections 4 and 5 respectively.

2. Literature Review

2.1 The concept of Lifelong Learning

This is an approach to learning that is concerned with seeking knowledge and skills from childhood until one dies (Tchamyou, 2020). It depicts the several forms of learning that an individual has to encounter as he/she lives, that is to say formal, non-formal, and informal learning (Tchamyou, 2020; Watkins, Marsick & Kim, 2011). While learning in a formal setting is accompanied by instructional, planned, and controlled learning, learning in

a non-formal setting encompasses the outdoor formal learning locales for example touring journey hence happens out of spur-of-the-moment (Binti Safie, Arshad & binti Idris, 2018). The approach of self-initiated learning remains to be understood as a way of capacity building for a labor force that is proficient in adjusting to a swiftly varying globe as stated by Sharples et al. (2010). The current research highlights that the basic notion of LLL is thoughtful learning that can and should happen during each person's life. Since LLL is very often applied to mature learning, the kind of education an individual gets beyond a formal learning setting is taken up as a component of LLL (Binti Safie et al., 2017). The intention of LLL rotates around enhancing competence among people (Hamidon et al., 2019). Hence LLL should continue throughout our lives beyond formal education and therefore, it cannot be associated with any specific age group or learning setting (formal, non-formal, or informal) as added by Agrusti et al. (2016)

In the report to UNESCO from the International Commission on Education (ICE) for the 21st century (2006), LLL is framed and summarized into four areas (Figure 1). This research took a broader understanding of LLL as a prolonged universal process of building skills and knowledge, accompanying it with the capabilities; methodologies as well as guidance that an individual needs to obtain right from the infant stage to the old stage to death.

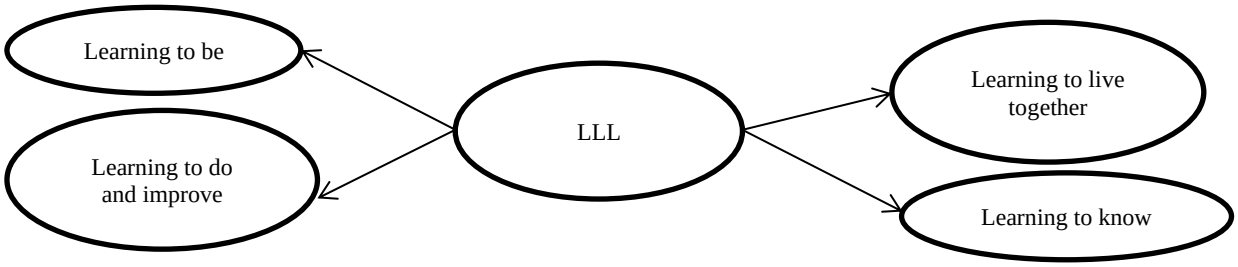

Figure 1*:* Four areas of LLL

Source: Synthesized by the Author(s) (2024)

The Mobile LLL Content Specifications

Endeavors have been put forward to create a disseminated LLL system for all to empower people with techniques for learning and living with flexible skills (Fischer & Konomi 2007; De Vries, Tattersall & Koper, 2006; Koper & Tattersall 2004). However, these techniques people can use to learn according to their life requirements and contexts (Trorey, Cullingford, & Cooper, 2019). Since technological innovations empower individuals to be linked and remain accessible independent of location, ML technologies have the prospective for individuals to have accessibility support to learning materials on the move (Sharples et al, 2009). The Mobile LLL Content Specifications include the following:

2.2 LLL Pedagogical Design Theories

When it comes to solving pressing issues, learning new information, and honing a skill whenever it's needed, LLL and human lives are inspirational. As a result, creating instructional materials that are easily integrated into practice while being informed by grounded ideas is crucial:

Connectivism Theory (CT): Siemens (2004) asserts that learning is predicated on a multitude of dynamic requirements. The person who feeds information into the network, which in turn feeds information back to others who feed information back into the network as part of a cycle, is the starting point of learning. Being able to filter content to identify which information is relevant to a user is crucial since there is a lot of information available in the connected network and that information is changing quickly.

Andragogy Theory (AT): This was suggested by Lippit & Knowles (1984), who based their claim on the fact that adults learn in a variety of methods different from children. His opinions surrounding andragogy aimed to take advantage of the distinct learning preferences and abilities

of adult learners. Eighty-three percent of adults were learning because their lives had changed in a variety of ways, including the dynamics of their jobs and families.

Social Constructivism Theory (SCT) (Sociological /Learning Theory): According to the work of Sica (2016) which is concerned with the social construction of reality, SCT covers the fact that the sociology of information catches human reality as communally embedded. In precise, this reality is explained by scholars by clarifying the realism of everyday life in which people's devotion to the current world is observed to be affected by exactly what they are doing, have done, and plan to do (Knoblauch & Wilke, 2016).

2.3 Design Principles of LLL Content: Content: Practical and Micro

LLL content is required to be hands-on and driven by practical-oriented challenges and problems for it to be engaging while remaining in the stream of people's everyday activities (Fischer & Konomi, 2007).

2.3.1 Activity: Micro and Simple ensure clarity in LLL activities; they should be as grainy as feasible, requiring only one stroke for each task (Churchill & Hedberg, 2008). These behaviors include but are not limited to, pressing a button and listening.
Usability is concerned with two aspects consistent, and simple. It mainly relates to user interface design (UiD), triangulation, controlling by learners, feedback from both learners and course designers, error control, constancy, and user fulfillment are correspondingly required in the project.

2.3.2 Drivers behind ML: While many acknowledge the importance of ML tools, some argue that learners are not motivated to use them for a variety of reasons (Jones et al., 2006). Furthermore, Jones et al. (2006) assert six (6) motivating reasons why ML technologies should be used: 1) control; 2) ownership and appropriation; 3) enjoyment; 4) communication; 5) learning-in-context; and 6) continuity between contexts. They contend that seasoned mobile users will be highly motivated to exploit the device's many settings to expand their learning opportunities and gain new information. Furthermore, by utilizing mobile phones and other devices, learners might be inspired in an informal setting by having the ability to transition between learning activities that are of interest (Martin, 2019; Jones et al., 2006).
According to Ferreira et al. (2018), learning that takes place outdoors beyond formal context has a paramount benefit to the learners to build their skills, and understanding with important and valued capabilities as long as the activity is correctly considered, sufficiently scheduled, and efficiently tracked. From the above, the mentioned six (6) factors outlined applied to the current study: the chances provided for contextual learning, teamwork and communication, media material access, ongoing learning assistance, supervision, students' contextual support, and information gathering. After identifying the advantages of ML that are significant to this investigation, the following subsection addresses the affordances of mobile technology in this study.

2.3.3 Mobile Technology Affordances; Following a thorough analysis of the state-of-the-art in mobile learning (Kang & Lin, 2019; Al-Emran, Elsherif & Shaalan, 2016; Zou & Li, 2015; West & Vosloo, 2013), a list of the main affordances of mobile technology for informal learning was discovered. These are outlined below and should be taken into consideration to encourage more people to learn on the go throughout their lives.

2.3.4 Portability and instant power-on capability: Unlike traditional learners, who may commit significant amounts of time to study each day, lifetime learners are not the same. Parents reading books on their commutes to work or while waiting to pick up their children from school is a familiar sight (Dylko & McCluskey, 2012). Because of the small size of mobile devices and the instantaneous power-on capabilities of mobile technology, learners can now make the most of their fragmented learning time.

2.3.5 On-demand capability: Students can now engage in problem-based learning thanks to this. A person will become more self-reliant and independent as they age, using knowledge to discover how to overcome difficulties (Al-Emran et al., 2016; Knowles, 1984).

2.3.6 Ability to accommodate active and multimodal learning preferences: The diversity of adult learners' learning preferences and diverse cultures must be recognized and cherished throughout the entire learning design process, even if adult learners have many similar learning traits. This has been made possible by mobile smart technology, which presents and delivers educational content in a variety of forms to suit a broad range of learning preferences and styles. As an illustration, mobile technology facilitates multisensory learning by offering interactive multimedia tools to users (Leone & Guazzaroni, 2012; Wong & Looi, 2011).

2.3.7 Mobile devices' built-in connect and communicate with the world feature through blue tooth, Wi-Fi, or mobile network affordance: This facilitates the ability of geographically isolated learners to quickly access an endless supply of global learning resources as well as to digitally connect and engage with learners globally (Kervin & Hindle, 2007).

3. Methodology

In the context of study design, the execution of this study comprised two parts, based on the human-centered design (HCD) approach (Heimgärtner, 2020). First, gathering requirements (Data gathering for specifying requirements). This helped to derive a set of requirements for designing the case model, and secondly, creation of the case model product (Model design).

The HCD approach begins with understanding the user's needs and creatively exploring the greatest means of meeting those needs (Vu & Lützhöft, 2020; Heimgärtner, 2020). It is known for devising successful design solutions (Pulman-Jones & Weatherup, 2019; Heimgärtner, 2020). Since any design intervention serves to assist people in achieving a given goal (LLL using mobile phones in this case), it has to be tailored to the user's characteristics and needs, as well as the external conditions affecting the use of the resulting products. Human-centered design is a standardized approach grounded on the premise of comprising users in each phase of the design process. It is employed as an iterative process where solutions are constantly evaluated to refine the design.

Specifying the user requirements was also considered and the requirements must be based on the context of use, as well as the users' and other stakeholders' needs and their tasks. Designing the model under investigation followed user specifications. The design stage is the stage at which the model was designed. The decisions were based on the established requirements in the previous stage. The acquired requirements were then used together with the adopted existing Parsons et al. (2007) model to come up with the model for promoting LLL using ML technology.

The study adopted both purposive/judgmental and convenient nonprobability techniques, Purposive sampling involved settings, people/subjects/events which are selected purposefully for the provision of required statistics that are impossible with other alternatives (Taherdoost, 2016). It includes selecting cases that are judged to represent similar characteristics. It involves selecting a sample based on the researcher's knowledge of the population being studied, its components, and objective(s). For example, people, cases/organizations, and units among others which being studied (Fugard & Potts, 2015). On the other hand, convenience sampling involves choosing participants who are often ready and easily available (Ackoff, 1953). Due to the affordability of the technique, it is more favorable to students in comparison to other techniques. The study applied Cochran's (1980) technique for determining sample size since it was simple to use concerning time constrain (Oribhabor & Anyanwu, 2019).

The data collected from questionnaires was compiled and analyzed using a statistical package for the social sciences (SPSS) software to attach the meaning to the data (interpretation). On the other hand, the qualitative data was examined by relating the dissimilar results in contrast to each other and creating key groups using the content analysis method. Content analysis involves coding and classifying qualitative data, also referred to as categorizing to make sense of the data collected, and to highlight the important messages, features, or findings. The results obtained acted as the context of use specification which informed the requirements for designing a model under discussion.

Ethically, the study was based on voluntary grounds. This means that the participants were free to withdraw from the study at any point in time. Hence, no bias is associated with incentive give-outs. Ethical clearance and research permits were obtained from all involved organizations. Following a thorough explanation of the study, a formal consent form was given to each responder. This was to make sure that participants had consent for their involvement in the study. Furthermore, there were no gender issues or matters caused by the study. This implies that whether female or male as long as he/she is amongst the target population was eligible to participate in this study in the presence of his/her consent. The anonymity of the respondents was ensured at all stages of data management, and finally, confidentiality and privacy were paramount to study participants. In that regard, the study ensured that participants voluntarily signed the informed consent form in ethical guideline four to declare their willingness to participate in the study out of their own free will. They were bound to abide by rules, culture, norms, customs, and regulations of where the data was collected.

The reason for the survey was to supplement the information obtained from the literature on defining the requirements needed to design a model for promoting LLL using M-L technology. The target population for this study was the IT department of the Uganda Bureau of Statistics (UBOS) and a randomly selected group of individuals who are yet to find employment in Uganda. The UBOS IT department had 30 members and a randomly selected group of individuals yet to find employment had 20 members, a total of 50 individuals formed the population.

Fifty (50) questionnaires were then administered to 30 employees of the department of IT- UBOS. The selection of UBOS was done based on the fact that UBOS is the central government agency whose activities need much continuous learning of how to manage ever-increasing data since its activities form a basis for national policy making, planning, monitoring, and management hence it's the mirror of the state. The other 20 questionnaires were distributed to randomly selected categories of individuals

who were yet to find employment. This category covered male and female individuals in years 20 and above who had completed their studies right from primary to higher education one year and above but had no employment found yet. The selection of this category was because the concept of LLL is closely related to improving employability from the base of adult education through promoting independent learning, and professional and occupational development. By participating in LLL individuals without employment can adapt more easily to changes in the labor market and better face strong competition from the global economy. Out of 50 questionnaires, 40 were returned with 25 filled. According to Cochran and Morris invented in 1980, in their sample size technique (formula) to determine a finite population sample size, for a population of 50, a total number of 25 respondents can yield meaningful results in a given study. Afterward, collected data was analyzed and presented in various forms such as tables, and graphs among others. Continuous data was grouped according to categories, while quantitative data was used to generate statistics, tables, and graphs.

4. Results and Discussion

The collected qualitative and quantitative data from the survey as well as the information obtained from the literature review was analyzed by comparing the different findings against each other and forming themes that were later categorized. These findings were used to determine the requirements for a model for promoting LLL using Mobile learning technology. The requirements cover the key elements to be improved to promote LLL among people. Each of these requirements is discussed in the next section. According to the results obtained from the literature review and survey, the following needed to be put into account when promoting LLL using mobile technology:

4.1 Facilitate individual and group learning styles

Findings of the survey showed that most of the respondents (48%) liked individual and group learning styles simultaneously. This is because both learning styles offer various benefits in an LLL setting. Individual learning enables learners to be creative and gain independence to think things through on their own, while group learning enables learners to share knowledge, experience, and abilities and to get a better hold of a problem than they could do individually (Laal & Ghodsi, 2012). Therefore, LLL course developers need to design for both learning styles.

4.2 Design for support of different content formats and edutech tools: According to the survey results, various content formats and education technology tools need to be used in the delivery of LLL content namely text, graphics, video, audio, social media, and emails. Respondents who "always" use a blend of these tools for learning were 42% compared to 40% who use a blend of these tools "sometimes" and 18% who "never" use a blend of these tools. Veerasamy and Nabila (2020) noted that when courseware is adequately packaged with the right blend of study material formats, it can potentially improve each learner's experience and inspire the learner to continue learning using any content format of interest Furthermore, most participants in LLL frequently use SMS to communicate, video and audios to learn, while others, especially those older, use corporate emails, audio and graphical (Shamsuddin & Kaur, 2020; Parsons at al., 2007). Therefore, LLL course designers and education technology developers need to design for different content formats and media.

4.3 Design for user learning experience: Course conveners need to monitor and evaluate the learning experience of lifelong learners using mobile technology. Their experiences need to be personalized, efficient, and enjoyable to keep them engaged and ensure their continued use of LLL materials. Therefore, mobile user experience design should focus on delivering services that are streamlined to serve spontaneous user needs that change with the context in which the user finds while keeping the interaction levels as low as possible. User experience goals include ease of use, attitude, and ease of learning, satisfaction, and enjoyment. From the survey results, the majority of respondents (23%) agreed with the statement that mobile phones are easy to use for learning. Also (52%) of the respondents had a positive attitude towards using mobile technology for learning purposes. According to Fu & Inskip (2019), good user experience (UX) motivates learners to interact with the content as well as reduces the number of steps (interactions) users have to perform to achieve their goals. With the exponential increase of people using Smartphones, user experience design in ML has taken precedence in the design such as focusing on learnability, ease of use, and leveraging native components of ML platforms. Therefore, LLL platform developers need to design for user experience to motivate learners during their learning process to achieve their goals.

4.4 Identifying areas of preference for Lifelong Learning: From the survey results, respondents showed that LLL would help them get equipped with topics and knowledge needed in their line of professions/interests as well as general cross-cutting areas/topics/Fields such as leadership and management, and business administration. Respondents amounting to 64% had their professions in the IT sector whereas 36% were interested in cross-cutting areas/topics/fields like health, leadership and management, business administration, and Research and Development.

Identifying areas of preference for LLL is relatively straightforward, but it can make a huge difference to the effectiveness with which one learns and achieving the intended learning objectives (Horrigan, 2016). Moreover, from the survey results, the majority of the respondents who were involved in certain forms of learning had LLL as their intended reason for learning such as improving their work skills (36%), getting new knowledge (36%), and personal development (16%). Therefore, LLL programs should span generic and specialized areas.

4.5 Design for reporting as well as tracking for the learner: This is so beneficial for the LLL course designer and IT expert to improve the content and tool functionalities respectively. Bonk and Graham (2012) refers to tracking as a process to measure the activities and completion rates in the learning environment. The levels of tracking include enrolments, activity, completion, score, certifications, quizzes, and others.

4.6 Design for support of assessment: This is concerned with the practical and problem-solving assessments of the learning content to determine whether it's suitable for solving the learner's immediate challenges. LLL course developers and IT experts need to design practical problems solving content, real-world experiences, and new demands for LL learners (English & Mayo, 2019). These practical problems and real-world experiences should aim at assessing helpful learning and the tool by users (Bonk & Graham, 2012).

4.7 Design LLL content and tool evaluation: This is concerned with the actions that focus on enhancing the operation of the ML tool, functionalities as well as learning content.

4.8 Adherence to LLL theories: From literature, three theories underlying LLL were identified: 1) Andragogy- which refers to variances in the way adults learn compared to younger people, especially those below the age of being employed as stated by Knowles (1984). Additionally, adults have busy schedules and engagements (Knowles et al., 1984). This has much influence on designing LLL content and its structure as well as mobile technology that supports it. 2) Connectivism- learning occurs based on a variety of constantly shifting essentials (Siemens, 2004). According to this argument, learning begins with an individual who feeds knowledge into a network, which in turn feeds information back to individuals, creating a cycle of feedback (Goldie, 2016; Siemens, 2004). This pedagogy is needed in designing effective mobile technology LLL courses because information such as experience, and procedures, needs to be fed into the platform any time anywhere. Additionally, the capability to see connections among areas/fields/topics, ideas, and concepts on the go is a core skill; and 3) Social constructionism- this is concerned with the fact that human reality is socio-technically constructed. For effective LLL courses through mobile technology, there must be an element of the instructor to guide the LL learners in the course. From these deliberations, these theories play a critical part as far as the design of effective mobile technology for LLL is concerned. This can involve determining which LLL content can best suit a group of LL learners, how to design content supported by mobile technology, etc. Therefore, it is essential to include and understand these theories of LLL earlier before designing mobile technology-based LLL courses because they define the path of the learning materials to be developed and highlight the specific methodologies applied.

Table 1: A summary of aspects to be considered for the model of promoting LLL using ML technology, key participants and their responsibilities

S/N	Aspect	Participant	Responsibilities
R1	Facilitate Individual and Group Learning Styles	IT domain experts	• Plan for support of both group and single learning experiences • Provide collaboration and communication support functions • Design for sharing and feedback support provisions
		LLL course designer	• Design content suitable for single and group education involvement
		LL learner	• Join a group of like-minded learners • Initiate the topics of discussion
R2	Design for support of different content formats and EduTech Tools	IT experts	• Design for support of various media and content formats
		LLL course designer	• Develop LL learning content • Customize learning content to various media and formats
R3	Design for User Experience	LL leaner	• Provide feedback on their ML experience • Share skills, experiences, and knowledge

		IT experts	• Design for user experience attributes • Provide evaluation support functions for the user experience attributes
		Government	• Subsidize mobile internet • Provide favorable policies and infrastructures
		HEIs/Scholars	• Integrate formal learning with real-world challenges and practical changes • Provide efforts to develop a common approach to LLL at tertiary institutions
R4	Identifying Areas of Preference for LLL	LL learner	• Providing their areas of preference for LLL • Setting their learning objectives and goals
		Government	• Provide a potential list of opportunities for LLL.
		Employers	• Provide areas of preference and the list of skills needed to perform various employments through LLL. • Provide off-work time for employees to participate in LLL • LLL incorporation into organization culture and operations • Organize lunch and learn stress employee LLL • Offers informal training and development
		IT experts	• Design for capturing areas of preferences for LLL
		LLL course content designer	• Develop the LLL course content • Match the learning content with the areas of preference for LLL
		Government	• Provide infrastructures, policies, and support
R5	Designing for support of Tracking, Reporting, Assessment and Evaluation	IT experts	• Planning for evaluation functions • Developing tracking with reporting tasks
		Course Designer	• Provision of learning content evaluation and criteria • Design learning activities • Developing real-world practical problems for learners to solve
R6	LLL theories Adherence	HEIs/Scholars	• Doing scientific research about the appropriate theories behind good Mobile technology for LLL • Provide guidelines and approaches on how to promote LLL in the HEIs • Doing Research on avenues of making LLL accessible to every person. • Forms the Integration of formal learning with real-world needs • Provide scientific research on the direction and access of LLL to target groups of people • Change teaching methods with conventional students studying for traditional degrees • Taking into account what people have learned from previous activities • Be involved in a range of partnerships

Note: R=Requirement,

Source: Field Data (2024)

A model for promoting LLL using ML technology: To address the need for encouraging LLL among people, the model expands upon the Parsons et al. (2007) design requirements model (DRM). The current DRM was

expanded using the requirements that emerged from the examination of the survey findings as shown in Table 1. Figure 2 displays the study's model. The enhancements close the loopholes in the DRM regarding encouraging LLL in individuals. The following are the enhancements made to the design requirements model (DRM):

Generic mobile design (mobility of leaner, device, and content): According to the requirements for promoting LLL among individuals, a necessity for provision of numerous learning materials in different presentations and edutech tools is required. The findings of the survey showed that most of the respondents prefer learning content presented in a variety of formats along with different edutech tools. Therefore, this component extends the generic mobile design to cover flexibility for the learner and his/her device (present in the current DRM). Also, content in various formats and edutech tool support that is missing in the existing models is presented in the study model. Apart from traditional text content, other enriched content formats such as videos, audio, images, graphical diagrams, and animation need to be supported along with different edutech tools such as digital cameras, YouTube, emails, social media, video cameras, and others. This motivates learners by increasing their interest to continue learning, hence improving information retention and learner's autonomy which are essential aspects of self-initiated learning.

ML context: According to the derived requirements, the learning context considered in promoting LLL among people is using group and individual learning simultaneously. In the extended DRM, the component of ML context maintains the importance and support for learning both in groups and individually.

Learning experience (learner and LLL course/tool): The extension made in this component is to enable LL learners, LLL course designers and IT experts to assess whether the designed course and tool itself are enjoyable, satisfying, and motivating. The component is linked to five (5) requirements established in this study for promoting LLL among people namely, adherence to appropriate learning theories, design for tracking and reporting, support for assessment, support for evaluation, and design for user learning experience. Each of these requires support from various stakeholders of the LLL program. Learning theory adherence requires efforts from the HEIs/Scholars and the government. Design for tracking and reporting, support for assessment, designing for user learning experience, and support for evaluation require the involvement of IT experts, course designers, and LL learners. The key aspect of this component is to improve the LLL content and tool based on experiences from the users while interacting with the course and tool for their learning goals. This can also help in reducing the potential risk of a mismatch between learning contexts and learning objectives.

Learning objectives (learning outcome and area of interest for learning): The extension made in this component is to enable LLL course designers and IT experts to recognize that different people have different things they want to learn to solve their immediate problems as their main learning objective, without enrolling into huge content as it is in the formal education. The component is linked to one requirement (identifying an area of preference for LLL). Provision of the area of preference for LLL requires the involvement of LL learners, LLL course designers, employers, and the government. The figure below illustrates the model for promoting LLL using ML technology obtained from extending the design requirements model.

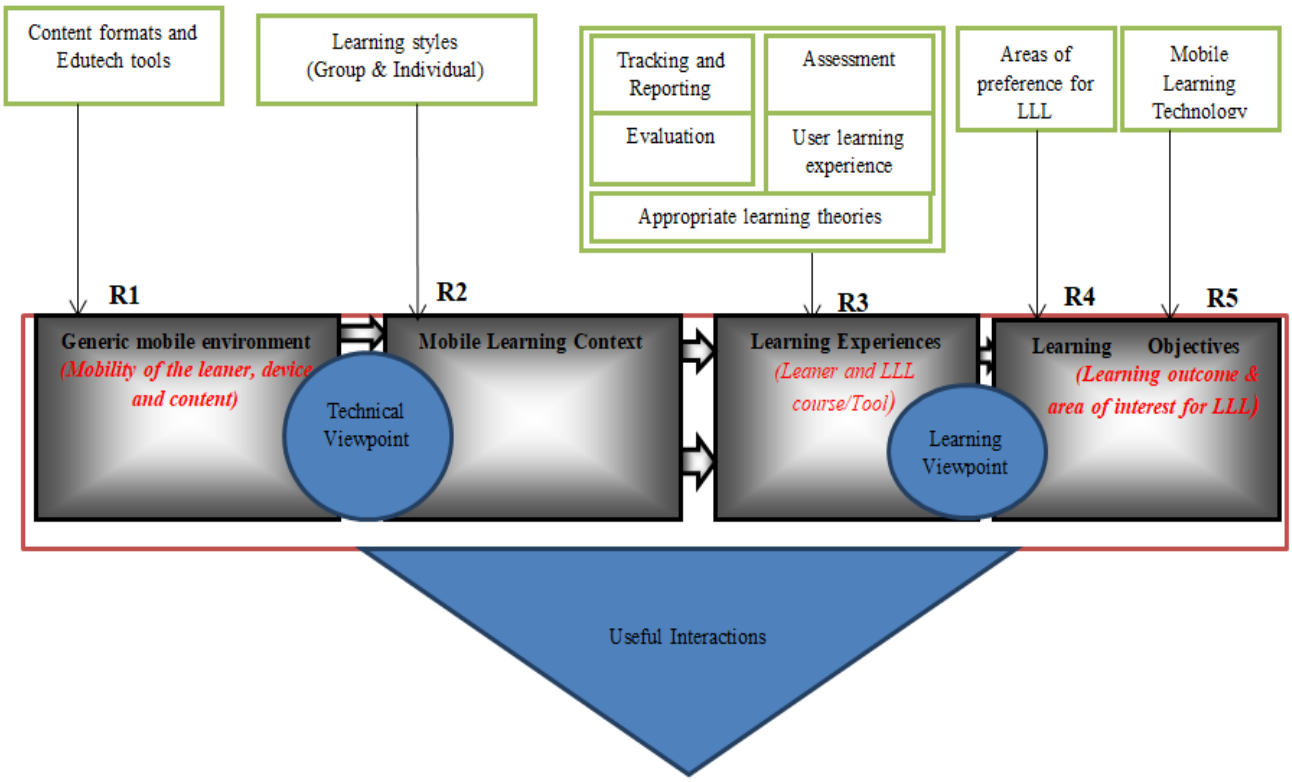

Figure 2: The Initial Model for Promoting LLL using ML Technology

Source: Field Data (2024)

5. Conclusion and Recommendations

The paper has presented the model for promoting LLL using ML technology. Relying on the context of use analysis, the researcher derived different requirements that should be addressed, hence leading to the designing decisions of the model. The requirements identified include; the need to enable both group and individual learning styles/environments, design for support of different content formats and EduTech Tools, design for user experience, identifying Areas of preference for LLL, design for tracking and reporting, support for assessment and support for evaluation and finally, adhering to LLL theories. Though there is an exceptionally good alignment between the paybacks of ML tools, LLL objectives, and developed models for promoting LLL, several actions need to be taken by those who can influence the development and research aiming at increasing and supporting LLL. Based on the findings, here are some of the recommendations for any initiative tailored to supporting lifelong solutions: a) Identify the worthiness of participating in learning in an unconventional, informal, or everyday context, b) More research on various LLL theories and their benefits is needed, c) Funding additional studies around M-L for LLL, particularly longer-term and larger-scale studies that are focused on vital LLL goals and those that explore orchestration of out-of-school learning, d) Enabling dispersed disadvantaged lifelong learners to become a valuable resource by providing mobile learning technologies and tools to help them share their local knowledge and expertise along with experiences and finally, based on the model and requirements, the model can be evaluated and tested along with the developed prototype interface to gather feedback from domain experts.

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