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Needs Analysis for Effective Implementation of Adaptive Personalised e-Learning in Higher Education: The Case of The Maldives National University

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Abstract: - E-learning has evolved to include advanced adaptive personalized learning environments (ALE) that cater to diverse learner needs. Systems that fail to adapt and provide uniform content are ineffective. While adaptive learning shows promise, its implementation in higher education is inconsistent, and best practices for designing and teaching adaptive courses are not well established. Therefore, in order to determine an effective approach to design and develop such an adaptive personalised e-learning environment, this study formulates the initial step of needs analysis contextualised to the Maldives National University (MNU). This analysis is guided by the integrated frameworks of Activity Theory (AT) and Personalised Learning Design Framework (PLDF). A survey was conducted among students, and interviews were held with lecturers and instructional designers. Additionally, a further analysis of relevant documents and the current LMS at MNU was performed. The results reveal that, although MNU supports personalized learning in teaching and learning practices, the current e-learning environment at MNU follows a traditional approach, providing uniform learning materials without considering the needs of learners. There is a significant need to integrate personalization concepts through adaptive e-content and provide customized learning paths within the current LMS to enhance student satisfaction and the effectiveness of e-learning at MNU.

Keywords: Personalised learning, adaptive learning, e-learning, e-content, higher education.

I. INTRODUCTION

Customizing education by tailoring learning opportunities and instruction to individual abilities and preferences has long been a goal for educators. Numerous studies have shown that personalized learning approaches are significantly more effective than traditional uniform methods, which typically rely on a single teaching style for all learners. Individual tutoring has been found to enhance learning performance compared to conventional teaching methods (Al-Chalabi & Hussein, 2020). Research suggests that a personalized system can be beneficial and impactful when the learning materials align with learners' preferences, leading to improvements in academic performance, learning outcomes, and learner satisfaction (Kumar et al., 2017). Therefore, personalization in educational environments contributes to higher quality learning (Al-Chalabi & Hussein, 2020).

The concept of e-learning has significantly evolved over the past decade, driven by technological advancements and changing needs of distance learners (Ahmed, Hussain, & Bagram, 2017). Traditional e-learning environments often provide static content that fails to address the diverse needs, goals, and learning styles of learners (Aeiad & Meziane, 2019). This "one style fits all" approach does not consider individual differences, making it less effective (El-Sabagh, 2021). Adaptive e-learning systems have emerged to offer personalized learning experiences tailored to individual needs and preferences, improving the quality of online education (Ahmed & Hina, 2019). These systems are increasingly implemented in higher education, providing customized content that enhances learning outcomes and supports the development of higher-order thinking skills (Ali et al., 2019; Behaz & Djoudi, 2012; Chun-Hui et al., 2017; Daines et al., 2016; Dominic et al., 2015; Mahnane et al., 2013; Vassileva, 2012).

Despite its promise, the implementation of adaptive learning in higher education remains sporadic, and more research is needed to optimize its design and effectiveness (Cavanagh, Chen, Lahcen, & Paradiso, 2020). Generating high-quality, adaptive content that meets diverse learner preferences is a key challenge for the research community (Shi et al., 2020). Additionally, presenting learning materials in ways that align with individual learning preferences is essential for the success of personalized adaptive e-learning systems (Hidayat & Afuan, 2021).

Considering the importance of content in e-learning and one of the important approaches for adaptive personalised learning, a study is intended to design and develop an adaptive e-learning environment to support personalised learning. Contextualising it to The Maldives National University (MNU), this research serves as the initial step towards the beginning of the process where a needs analysis is required to be carried out. The study

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aims to conduct a needs analysis to identify the current practices of personalised learning in the e-learning delivery at MNU and what are the needs required to design and develop an effective adaptive personalised e-learning environment based on the perceptions and beliefs of the stakeholders involved in the design and implementation of e-learning environment. The study consists of the following specific objectives:

- O1: To determine the current state of MNU in practising and applying the practices of personalised e-learning in the e-learning delivery
- O2: to determine the necessary needs for the design and development of an enhanced and effective adaptive personalised e-learning environment at the context of MNU.

II. RATIONALE

Quality assurance in e-learning is a major debate among scholars, as it requires different considerations compared to traditional education due to its unique philosophical, theoretical, and pedagogical modes. Ensuring high-quality e-learning is crucial for its future, with adaptive e-learning environments seen as a way to enhance quality. High-quality e-content design, development, and implementation are essential for successful e-learning delivery, especially in higher education institutions like MNU.

Studies highlight significant challenges in integrating quality e-learning in higher education institutions (HEIs) in developing countries (Tarus, 2015; Makokha, 2016; Chawinga, 2016; Baloyi, 2014a; Muuro, 2014; Baloyi, 2014b; Queiros & de Villiers, 2016; Arinto, 2016). With the increasing demand for e-learning and the push for excellence due to globalization, there are global calls to enhance and assure e-learning quality, particularly in developing countries. These countries often struggle with weak content development and limited access to advanced applications (Aung & Khaing, 2015). Providing content such as videos and advanced applications remains new for many educators, even at the higher education level (Aljawarneh, 2020; Lara et al., 2020; Lizcano et al., 2020). As a developing country, the Maldives can use research outcomes to address these global challenges.

Learner satisfaction is crucial in e-learning environments due to its impact on the relationship between users and the system (Jung, 2014). Higher satisfaction levels enhance the likelihood of continued use (Lim, Lim, & Lim, 2022). Researchers have found that the success of an e-learning environment can be measured by learners' satisfaction and their intention to use it long-term (Naranjo-Zolotov, Oliveira, & Casteleyn, 2019). Continued satisfaction is a key indicator of an e-learning environment's success (Martins et al., 2018). Assessing learner satisfaction is essential for understanding system functionalities, performance, and capabilities, which facilitates a productive learning experience (Cidral, Oliveira, Di Felice, & Aparicio, 2018). High satisfaction contributes to lower dropout rates, higher persistence, and greater commitment to programs, helping improve e-learning practices at MNU.

III. LITERATURE REVIEW

3.1 Personalised Adaptive Learning in Teaching and Learning

The rise of personalized education stems from the need to address diverse learning styles and rhythms in multicultural classrooms and to meet high professional demands in the workplace. According to Costa et al. (2022), education must adapt to help learners participate in society, live as active citizens, and develop necessary skills for their careers. B. F. Skinner, a pioneer of personalized learning, emphasized breaking down material into smaller parts and tailoring tasks to learners' current knowledge levels (Morze et al., 2021a). Personalized learning focuses on providing effective, customized, and efficient learning paths, engaging each learner in the process (Al-Chalabi & Al-Chalabi, 2020). Modern instructional design supports learning through flexible, personalized, and on-demand tools.

Personalized learning adapts the pace, sequence, technology, strategy, and content to each learner's needs (Mikić et al., 2022). This approach aims to offer relevant, interest-driven activities that are often self-initiated (Ilić et al., 2023). Research by Arsovic & Stefanovic (2020) shows that adaptive learning environments improve outcomes and achievements by meeting individual needs and competencies. El-Sabagh (2021) adds that such environments promote self-learning, attract learners, and increase engagement.

Creating a consistent learning environment tailored to individual needs is crucial for increasing learner motivation and effectiveness. Adaptive learning involves personalizing educational experiences and adjusting teaching methods to meet diverse learner requirements (Arsovic & Stefanovic, 2020; Burak & Gultekin, 2022). Research indicates that adaptive personalized learning environments positively impact teaching quality and learner self-awareness (Fakoya, Adewale, & Agbonifo, 2020). These systems enhance learning efficiency and performance

by providing individualized content and optimal learning paths based on each learner's profile (Essa, Celik, & Human-Hendricks, 2023; Hmedna, El Mezouary, & Baz, 2020).

Personalized learning shifts from a one-size-fits-all approach to a learner-centered model, maximizing learning and helping learners achieve course objectives more effectively and at a lower cost (Hidayat & Afuan, 2021; Raj & Renumol, 2022). The rapid growth of educational technology and the abundance of online resources highlight the need for tailored learning environments to prevent knowledge overload and improve learning performance and satisfaction (Raj & Renumol, 2019; Hwang et al., 2020b). Given the diversity in learners' styles, approaches, and intellectual development, a personalized approach is more beneficial than a uniform one (Fariani et al., 2023).

3.2 Personalisation and Adaptation in e-learning

Traditional teaching methods do not allow tutors to offer personalized and adapted lessons based on each learner's preferences and needs (Maravanyika et al., 2017). While technological platforms accessible via computers or smart devices can aid personalized learning, they may limit classroom activities (El Guabassi et al., 2018; Kurilovas, 2016). Peng (2019) describes personalized adaptive learning as a technology-driven pedagogy that adjusts teaching strategies in real-time based on learners' individual characteristics, performance, and development. With the growing demand for technological skills and the positive impact of technology on learning, effectively integrating technology into instruction is crucial for effective teaching (Kale et al., 2020). Various models and frameworks have been developed to guide this integration.

E-learning has become a significant aspect of modern educational systems, especially in higher education, where it supports interactions and creates new learning environments. These environments offer access to digital materials, interactive resources, and tools for creativity, design, and personalized learning support. They also facilitate collaboration, data analysis, and organization (Aeiad & Meziane, 2019). However, a major concern is the static nature of e-learning content, which does not cater to the diverse interests, expertise levels, and learning styles of learners.

To ensure successful e-learning outcomes, systems need flexibility, adaptability to learner needs, and effective design of electronic content (Ahmed & Hina, 2019). The focus is shifting towards learner-oriented platforms that prioritize learner expectations, motivation, habits, and learning styles. Adaptive e-learning environments (ALE) are emerging to address these needs by tailoring the learning process to individual learner preferences within learning management systems (Normadhi et al., 2019; Oxman & Wong, 2014). This approach enhances the practicality and effectiveness of e-learning by providing personalized and adaptive content.

3.3 Needs Analysis in the Design and Development Research

Richey and Klein (2007) define Design and Development Research (DDR) as the systematic study of design, development, and evaluation processes to establish an empirical basis for creating instructional and non-instructional products, tools, and models. This research is particularly relevant for developing artefacts like products, tools, models, new technologies, and learning objects to solve complex practical problems through human creativity and interaction (Ellis & Levy, 2010). DDR is crucial in educational technology for creating model designs and theorizing (Richey, p.123).

DDR typically involves three phases: need analysis, design and development, and evaluation. Each phase serves a specific purpose, helping researchers systematically organize their work throughout the study (Maaruf et al., 2019).

Analysis phase is the initial phase in the DDR. Needs Analysis (NA) is an essential component of the Design and Development Research (DDR) process, which focuses on identifying the specific requirements of stakeholders to inform the design and development of educational programs, products, or systems. According to Satriani and Ermanto (2020), needs analysis is essential at every stage of implementing an education system. It serves as a tool to evaluate needs, allowing for steps to address them, thereby maintaining commitment and enhancing the learning experience's significance and effectiveness. This phase is pivotal in ensuring that the final output aligns with user needs and context. It serves to:

- Identify the gap between the current and desired performance.
- Determine the priorities and importance of addressing these gaps.
- Guide the design process to ensure relevance and effectiveness (Dick, Carey, & Carey, 2015).

IV. THEORETICAL UNDERPINNINGS

This study utilized the Activity Theory (AT) framework to analyze the interactions among various components and actors in adaptive personalized learning research. AT defines an activity as a system of purposeful behaviours

leading to recognizable changes in human practices, highlighting the roles and relationships among stakeholders influenced by individual and social factors (Kim, 2010; Engeström, 2001). The key components of an activity include subject, object, technology, rules, community, and division of labor (Engeström, 2001). Learners are the subjects; technology refers to the tools used for adaptive personalized learning environments (ALE); objects are the skills and behaviours ALE aims to improve; rules are the accepted practices for implementing ALE; community includes those involved in ALE interventions; and division of labor refers to the distribution of responsibilities among community members.

The effectiveness of ALE depends on accurately categorizing and utilizing information about learners' preferences to create adaptive learning environments (Bajaj & Sharma, 2018; Essa, Celik, & Hendricks, 2023). To personalize instruction effectively, a clear vision is needed to outline how instruction can be tailored, what factors inform personalization, and who is responsible for customizing instruction. Therefore, this study uses the Personalised Learning Design Framework (PLDF) by Short (2022) along with AT to address these aspects, providing a structured approach to defining, designing, and evaluating personalized learning. The PDLF guides for the following:

- What aspect of instruction is being tailored to the learner – learning objectives, assessments of learning, or learning activities?
- Along which dimensions of PL is instruction being tailored to the learner – time, place, pace, path, and/or goals of learning?
- Who or what is tailoring the instruction – the educator, the learner, or an instructional application/system?
- At what level of the Taxonomy of Learner Agency is instruction being tailored to the learner–is the instructor differentiating instruction (Level 2), providing learning options for the learner to select from (Level 3), or guiding learners in creating their own learning options (Level 4)?
- What kind of data is used to inform the tailoring of instruction – performance, activity, and/or learner profile data?

Therefore, to get a holistic analysis on the current implementation of e-learning and determining the needs an integrated framework of AT and PLDF as presented in Fig.1 was used as a guiding blueprint for the study.

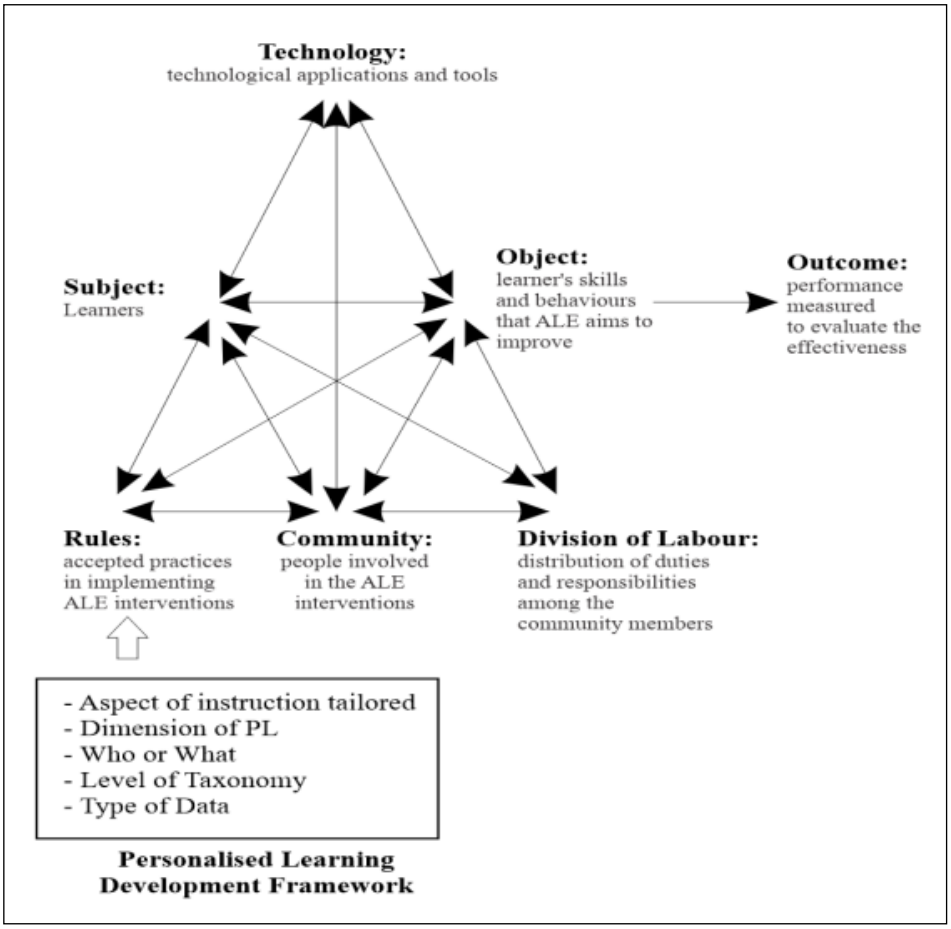

Fig. 1. Integrated framework of AT and PLDF

Mainly, determination of study particioants and performance measure and rules for the implementation of personalised learning was addressed based on AT. To further determine appropriate rules, the concepts presented within PLDF was used as it provided clear guidance on the aspects of a personalised learning environment.

V. METHODOLOGY

5.1 Design Approach

For this study, a case study methodological approach was adopted. Yin (2009) defines a case study as an empirical inquiry into a contemporary phenomenon within its real-world context, especially when the boundaries between phenomenon and context are not clearly evident. This method allows for an in-depth focus on the case and covers a wide range of contextual and intricate conditions (Yin, 2012), making it suitable for analysing complex qualitative research problems (George & Bennett, 2005). Case studies are appropriate for research guided by descriptive questions, data collection from natural settings, and evaluations (Yin, 2012).

This approach fits the current research context, enabling the researcher to understand personalized learning perceptions of three stakeholder groups at a university: learners, instructional designers, and subject matter experts. Involving these groups is crucial to understanding the institution's current state and further needs regarding personalized learning. The case study method allows for investigating and retaining the holistic and meaningful characteristics of real-life events (Yin, 2003). A single case study design was used, focusing on the Maldives National University (MNU) as the unique case. According to Yin (2012), a single case study design is appropriate when the case represents a unique instance.

5.2 Data Collection and Analysis

Data for this case study was collected from various sources, as good case studies gather evidence from multiple sources (Yin, 2012). Considering that, questionnaires, documents, Moodle course pages, learner focus groups, and staff interviews were used to collect data. Table 1 below summarizes the data collection and analysis methods for the study.

Table I: Summary of data collection and analysis methods

Data	**Collection Method/ Source**	**Participants**	**Instrument/ Tool**	**Focus Area**	**Data Analysis**
Quantitative	Survey	Learners (Learners) enrolled in e-learning delivery course	Learner Satisfaction Questionnaire (Lim, Lim and Lim, 2022).	• Interface • Learning community • Content • Personalisation	Descriptive (Mean level of satisfaction)
Qualitative	Interview	• Lecturers who are teaching in a blended delivery course. • Instructional Designers.	Semi-structured interviews using the episodic interview method	• Perspective on the necessity • Challenges / lacks • Wants • (Nation and Macalister, 2010)	Thematic Analysis (Brand and Clark, 2006).
	Document	• strategic plans, • related institutional policies and guidelines,	Criteria and standards	• Current emphasis on personalised • learning	Document Analysis (Flick, 2009; Yin, 2012)
	Artefacts	Moodle course pages of various disciplines (e.g., education, science, nursing, management and Islamic studies)	Criteria and standards	• Types of content used • Level of personalization • Technology/ Tools	Artefact Analysis (Yin, 2003)

A questionnaire was distributed to learners enrolled in e-learning courses via Moodle LMS during the data collection period. The purpose of this questionnaire was to gather descriptive statistics on learner satisfaction with the current e-learning environment at MNU. This data would serve as a foundation for further data collection through interviews. The questionnaire was adapted from the validated Learner Satisfaction Questionnaire (LSQ)

by Lim, Lim and Lim (2022). The LSQ was developed to measure learner satisfaction with e-learning systems and was preliminarily validated through exploratory factor analysis. The questionnaire is used to measure learner satisfaction specifically with adaptive e-learning systems, consisting of 14 items based on four major constructs: (i) Learner Interface, (ii) Learning Community, (iii) Content, and (iv) Personalization.

Semi-structured interviews using the episodic interview method were conducted with academics involved in e-learning delivery and instructional designers who collaborate with faculties to design e-learning courses using Moodle LMS. These interviews were aimed to uncover practical difficulties, challenges, and policy-related issues in implementing effective personalized learning practices across the university. Interviews are a crucial source of information for case studies (Yin, 2003) and are commonly used in qualitative research to reconstruct the interviewee's subjective theory about the issue under study (Flick, 2009).

In addition, course pages of various disciplines (e.g. education, science, nursing, management and Islamic studies) from the Moodle LMS were examined as artefacts that could serve as physical evidence related to the case study which is according to Yin, 2003, a useful method of collecting data for a case study (Yin, 2003). Screen prints of these courses were obtained which include general structure and organisation of course pages, discussion forums, interactive tools (e.g., wikis. quizzes and chats) and assessments. Similarly, documents such as, but not limited to strategic plans, related institutional policies and guidelines, subject outlines and documents used in the instructional designing process were analysed to understand how personalised learning is being implemented across the university which is according to Flick (2009) and Yin (2012), an important source of data in qualitative research. These various sources of data allowed researchers to triangulate collected data increasing the validity.

For data analysis, each source of data was analysed independently. Learner questionnaire data was analysed using descriptive statistics and mean comparisons to identify broad trends. Content analysis was used to summarize main ideas from documents and artifacts. Interviews underwent combined theoretical and thematic analysis. Audio recordings were be transcribed, followed by theoretical analysis based on Activity Theory (AT) and the Personalized Learning Design Framework (PLDF), using the strategy of "relying on theoretical positions" (Yin, 2003). Thematic analysis and coding were carried out to ensure all emerging themes are included in the theoretical analysis. This process refines theoretical analysis and ensured that all important ideas and categories in the results were included.

VI. Results and Discussions

6.1 Learner Satisfaction Survey Results

From the survey questionnaires administered online, a total of 49 responses were received. Participants were mainly from four different faculties who were registered to different levels of courses and are from multiple disciplines. Table 2 presents the demographic data for the participants.

Table II: Demographic Data of the Participants

Demographic Characteristic		**No.**	**%**
Faculty	Faculty of Health Sciences	7	14.3%
	Faculty of Education	3	6.1%
	Faculty of Shariah and Law	2	4.1%
	School of Nursing	37	75.5%
	Total	49	100%
Course Level	Diploma	2	4.1%
	Bachelors	44	89.8%
	Masters	3	6.1%
	Total	49	100%
Course Discipline	Islamic Studies	2	4.1%
	Social Works	6	12.2%
	Dhivehi Language & Teaching	3	6.1%
	Primary Health Care	1	2.0%
	Nursing	37	75.5%
	Total	49	100%

Demographic Characteristic		No.	%
Course Semester	Semester 1	4	8.2%
	Semester 2	3	6.1%
	Semester 3	4	8.2%
	Semester 5	4	8.2%
	Semester 6	2	4.1%
	Semester 7	32	65.3%
	Total	49	100%

As illustrated in Table 1, the majority of the learners (75.5%) are from the School of Nursing and are continuing their studies in the field of nursing. Additionally, 89.8% of the learners are pursuing a bachelor's degree, and 65.3% are in the seventh semester of their course. This suggests that most of the respondents have been engaged with the current e-learning environment at MNU for an extended period.

The items measuring satisfaction levels on the constructs of the Learning Satisfaction Questionnaire (LSQ) were rated using a 5-point Likert scale, where 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, and 1 = Strongly Disagree. The average ratings for all items within each construct—Learner Interface, Learning Community, Content, and Personalization—were calculated, and the results are presented in Fig. 2.

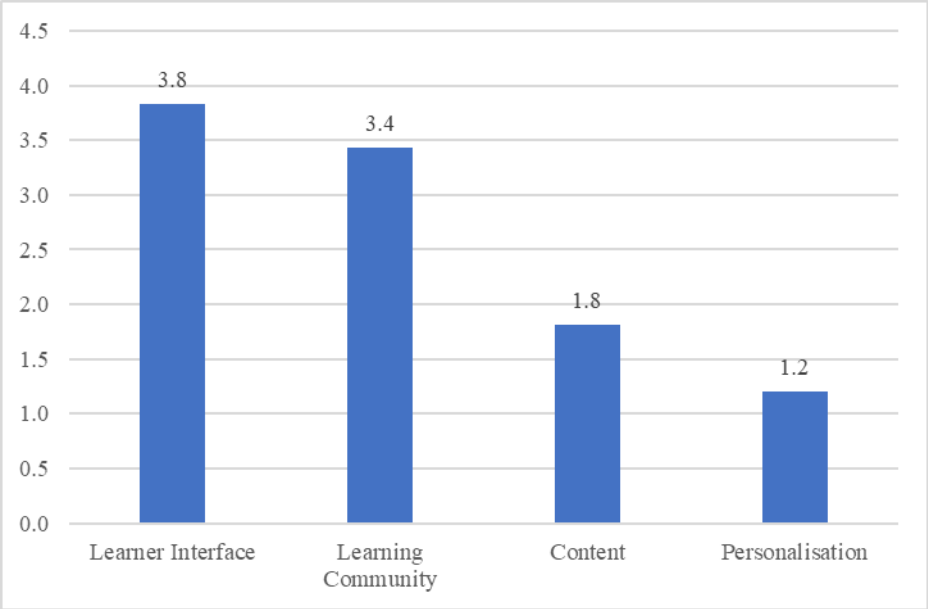

Fig. 2. Level of satisfaction of participants within the current e-learning environment at MNU

Based on Fig. 2, it was found that, on average, learners feel somewhat satisfied with the learner interface and the learning community they could establish within the current e-learning environment. However, a low mean of agreement was observed regarding the content provided and the personalization within the current e-learning environment. Further results of the individual items within these two constructs are illustrated in Table 3.

Table III: Responses of Participants to LSQ Items

LSQ Construct	Items	Average
Content	The system provides up-to-date content.	2.1
	The system provides the type of content that exactly fits my needs.	1.2
	The system provides sufficient content for me to achieve the learning outcome.	2.1
	The system provides useful content.	1.8
Personalization	The system enables me to choose what I want to learn.	1.1
	The system enables me to control my learning progress.	1.2
	The system records my learning progress and performance.	1.2
	The system recommends topics that reflects my learning progress.	1.3

From Table 3, it is evident that the average responses for all items related to content and personalization were low, indicating a need for improvement in these aspects within the current e-learning environment at MNU. Most learners agree that the content provided does not meet their specific needs and is not particularly useful. Additionally, there is minimal agreement that the Learning Management System (LMS) allows them to choose what they want to learn.

The survey results indicate that learners are generally dissatisfied with the current e-learning environment at MNU, particularly regarding content and personalization. These findings align with Aung and Khaing's (2015) argument that developing countries often face challenges in content development. Therefore, there is a pressing need to explore potential approaches to providing personalized content to enhance e-learning and implement personalized e-learning within MNU.

6.2 Results of the Interview

Interviews were conducted with lecturers who teach online courses and instructional designers who assist in creating learning experiences for online learners. A total of five lecturers and two instructional designers participated in the interviews. Following the needs analysis procedure suggested by Nation and Macalister (2010), the purpose of these interviews was to identify the current necessities, challenges, and requirements for implementing effective personalized learning in the e-learning environment at MNU. The questions were designed using episodic interview methods, where participants shared their experiences as narratives of specific situations. The questions were formulated based on the survey results to validate the findings through triangulation. The interviews were transcribed, and the data was analyzed using a thematic approach, following the steps outlined by Brand and Clark (2006). The results are presented in Table 4.

Table IV: Results of the Interviews

Criteria/Theme	**Participant**	**Codes**	**Sampe Text**
Current Practice / Necessity	Lecturer	• Somewhat importance given in class but not in online activities • Personalization is required – each learner is different • Support learner learning	*"I do try to use different approaches to cater for different learners at my face-to-face class... yes of course that much importance is not given when I create online activities in Moodle…but of course it is very much needed..."*
	Instructional Designer	• Learner analysis is required in ID process • Not well implemented	*"We actually are required to start the instructional designing process with a needs analysis which include to know the target learners and their level of knowledge and preferences ...But usually it is not practiced well until now…"*
Challenges / Lacks	Lecturer	• Unavailability of materials / resources • Support for content creation • Workload / time • Mechanism to collect learning needs of learners • Readiness / Competencies / Skills • Class size	*"I have to manage large number of learners… around more than 100… So even though I wanted it I almost difficult for me to implement within my class… but yea with the help of technologies it could be implemented in Moodle…"* *"As I am not from a teaching or education background, I really do not actually know how to implement it in the best possible way…and within MNU a well-structured support system is not established to develop content also…"* *"We do have a learner profile option on both Moodle and the self-service learner portal…but it only gives general information and do not have information about their learning preferences or needs or their level of knowledge…"*
	Instructional Designer	• Unavailability of materials / resources • Support for content creation • Readiness / Competencies / Skills	*"As instructional designers we face lots of challenges mainly due to resistance from faculties to collaborate in developing content or designing learning…there is lack of support from faculties to create content…yes..."*

Criteria/Theme	Participant	Codes	Sampe Text
Wants / Needs	Lecturer	• Guidelines / best practices • Support to create content • Technical implementation within Moodle with automatic adaptation • Training and professional development	*"One thing as a lecturer I do need guidance…also we need to establish systems within MNU that provides information about learners…I mean in an easier way…may be through Moodle or self-service portal..."* *"We need strategies for implementation and a good support mechanism…yea also we need training…"*
	Instructional Designer	• Guidelines / best practices • Support to create content • Adaptive e-learning environment • Learning Analytics • Training and professional development	*"Yes… we need guidelines…but most importantly it needs to be implemented and monitored... The Moodle needs to be integrated with advanced features to generate learning analytics automatically…"*

Both lecturers and instructional designers recognize the importance of personalized learning and the need for its effective implementation. However, lecturers struggle to apply personalized learning in online settings, despite successfully doing so in physical classrooms. Instructional designers also stress the significance of conducting a needs analysis during the instructional design process, which is currently not being adequately addressed.

Lecturers cite several reasons for their difficulties in implementing personalized learning, including insufficient materials and support for content creation, heavy workloads, and large class sizes. They also feel they lack the necessary skills and confidence. Instructional designers agree with these challenges. Additionally, lecturers pointed out the lack of a systematic procedure at the university to identify individual learners' needs and preferences.

Both lecturers and instructional designers expressed a need for guidelines on best practices for personalized learning implementation and technical support for integrating personalized learning within Moodle to create an adaptive learning environment. Instructional designers also highlighted the importance of generating learning analytics within the LMS.

In summary, the interview results suggest that lecturers and instructional designers face challenges in facilitating a personalized e-learning environment due to uncertainty about design and implementation. This finding is consistent with the observations of Aljawarneh (2020), Lara et al. (2020), and Lizcano et al. (2020), who noted that many higher education educators are still unfamiliar with providing advanced content such as videos and applications. These results further corroborate the learners' dissatisfaction with the content and personalization of the current LMS at MNU.

6.3 Documents Analysis

Document analysis was conducted to determine whether MNU as a university emphasize or support towards personalised teaching and learning practices. Total of five documents that were available from MNU website were analysed including; MNU Strategic Plan 2020-2025, Teaching and Leanring Policy, Curriculum Development and Review Policy, Assessment Policy and Policy on e-learning. The results are presented in Table 4 where statements from all the documents that is related to the concept of personalised learning are underlined.

Table V: Results of Document Analysis

Document	Emphasis on Personalised learning
MNU Strategic Plan 2020-2025	Goal 1: Academic Excellence • 1. Maximise access to educational opportunity and enhance University experience for national and international learners through innovative, flexible and inclusive high-quality education. • 2. Ensure that the outcomes of university programmes meet the needs of all relevant stakeholders and are progressively improved through systematic review.
Teaching and Learning Policy	• Purpose (2): To support and promote teaching that focuses on learner diversity, inclusivity, experience and employability; • 5. Principles of quality teaching: • 4: Builds on learners' existing knowledge • 5: Caters for learner diversity • 9: Monitor learner progress and provide quality feedback

Document	Emphasis on Personalised learning
	• 6. Policy directives: • 6.1.c. meet the diverse needs of learners from different life experiences and recognize individual learning needs and extend the learner's range of approaches to learning; • 6.1.d. respect, recognise and build on learners' current knowledge and experience and provide appropriate opportunities…. • 6.1.e. provide a variety of meaningful strategies and contexts to enable learners to construct and apply new knowledge and skills • 6.1.g. create opportunities for regular feedback about learning progress which acknowledges individual learning achievements • 6.2.f. use learning analytics systems to help Personal Tutors/lecturers to provide effective academic support and enhance learning
Curriculum Development and Review Policy	• 5. Principles • 5.1. It is responsive to the discipline / field, to the learners' learning needs, and to the social context... • 6. Curriculum Design and Development Standards • 6.8. All courses incorporate opportunities for flexible learning, experiential learning, self-regulated learning, inquiry-based learning and critical thinking related to the field.
Assessment Policy	4.2. Purposes of Assessment: • 4.2.4. to provide feedback to staff to indicate areas in which learners are experiencing difficulties and to identify and diagnose in effective teaching;
Policy on e-Learning	• 6. Policy directives: • 6.2. Develop e-Learning courses and subjects in conjunction with international best practices… The pedagogical models and innovation strategies to be used in delivering e-Learning programmes • 6.3. develop online learning and teaching resources that are up to date

A document analysis was conducted to determine whether MNU, as a university, emphasizes or supports personalized teaching and learning practices. A total of five documents available on the MNU website were analyzed, including the MNU Strategic Plan 2020-2025, the Teaching and Learning Policy, the Curriculum Development and Review Policy, the Assessment Policy, and the Policy on E-learning. The results are presented in Table 4, where statements related to the concept of personalized learning are underlined.

As shown in Table 4, MNU strategically supports the implementation of personalized learning within the university. However, the results from the learner survey and interviews with lecturers and instructional designers indicate that personalized learning is not being implemented effectively. There is a significant need to identify effective approaches and overcome challenges to ensure its successful implementation.

6.4 Analysis on Learning Management System (LMS)

The course pages of 10 subjects in the current LMS at MNU were analyzed to determine the level of personalization. These subjects spanned various fields, including nursing, language, teaching and education, and computer and IT. The first aspect analyzed was the types of content provided to learners, with the results presented in Fig. 3.

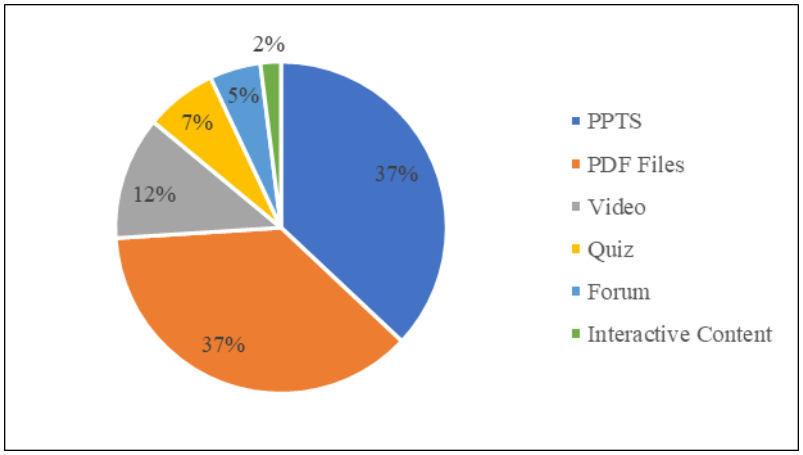

Fig. 3. Types of content offered within current LMS at MNU

As shown in Fig. 3, the majority of subjects (37%) offered content primarily in the form of PDFs and PowerPoint presentations (PPTs). Only a small percentage (2%) of the pages provided interactive content. Therefore, currently the LMS at MNU provides uniform content for all the learners and it could be concluded that the learning preferences of learners are not considered. This issue is not new, as Morze, Varchenko-Trotsenko, Terletska, and Smyrnova-Trybulska (2021) suggest that HEIs still rely on unified learning materials. his is a major concern among educators, as reflected in the literature. This further relates to the responses from the learners as well as the lecturers and instructional designers.

Additionally, based on the PLDF, the Moodle course pages were analyzed to determine the dimensions of personalized learning currently applied within the LMS for the online learners at MNU. The results are presented in Fig. 4.

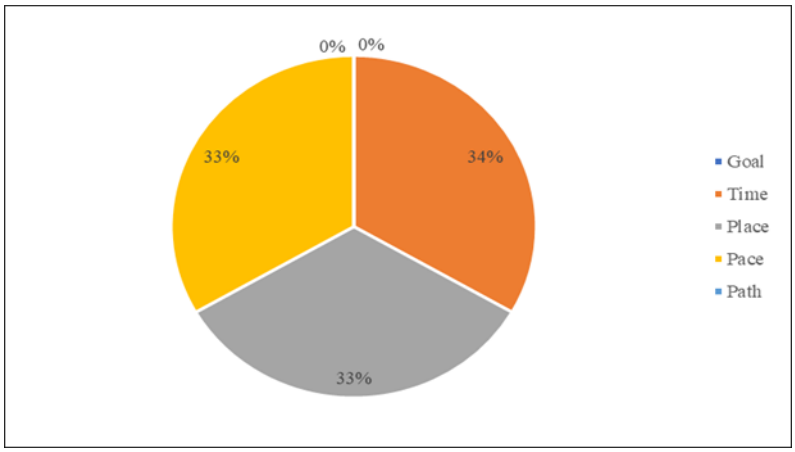

Fig. 4. Dimensions of personalised learning in the current LMS at MNU

As depicted in Fig. 4, the current LMS at MNU allows learners to continue their learning anytime, anywhere, at their own pace. These are general aspects of e-learning, providing accessibility to the LMS through the Internet from any location, enabling learners to engage with online learning activities and content. However, none of the subjects allowed personalization based on learners' goals or suggested tailored learning paths based on their preferences. These are among major aspects of personalized learning and relates with the learner's dissatisfaction level with the content and personalization constructs of the e-learning environment.

The PLDF further details the levels of personalization autonomy. Following it, the Moodle course pages were analyzed to determine the level of personalization autonomy is allowed to the learners within the LMS. The results are illustrated in Fig. 5.

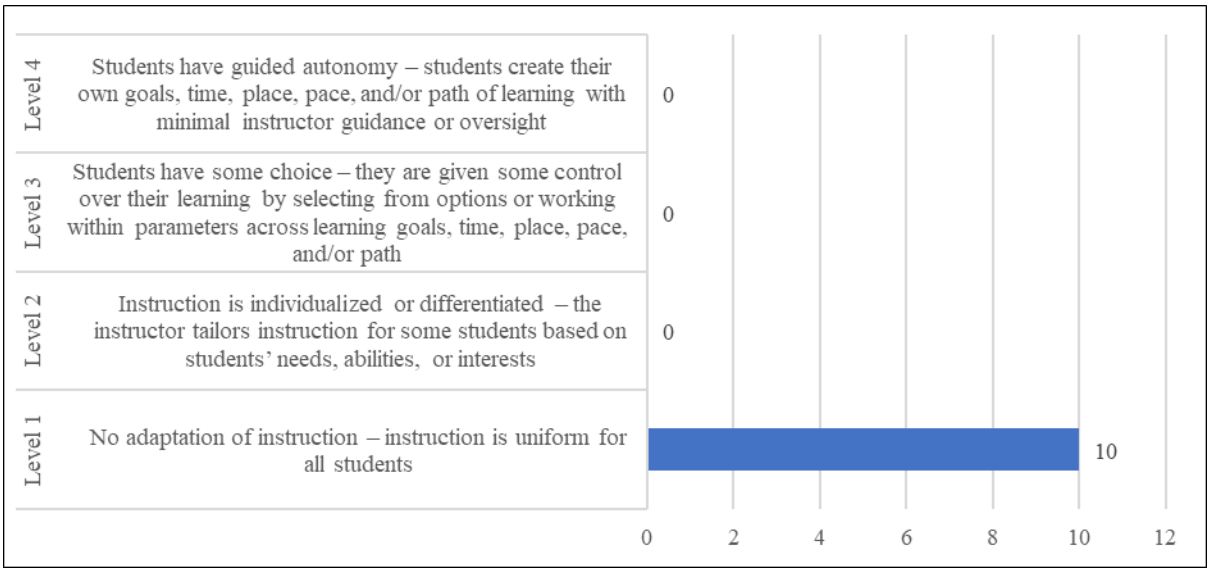

Fig. 5. Levels of personalization autonomy in the current LMS at MNU

As clearly depicted by Fig. 5, all the course pages are at Level 1, where there was no adaptation of instructions observed. This indicates that the instruction is uniform for all the learners. This no doubt translates to learners being mostly dissatisfied with the LMS as it does not allow them to choose what they want to learn.

Since Moodle LMS is the main e-learning environment where learners interact at MNU, it was further analyzed for the technical possibilities that could support the implementation of personalized learning by providing adaptations based on learning preferences. The tools currently supported within the Moodle LMS at MNU are shown in Fig. 6.

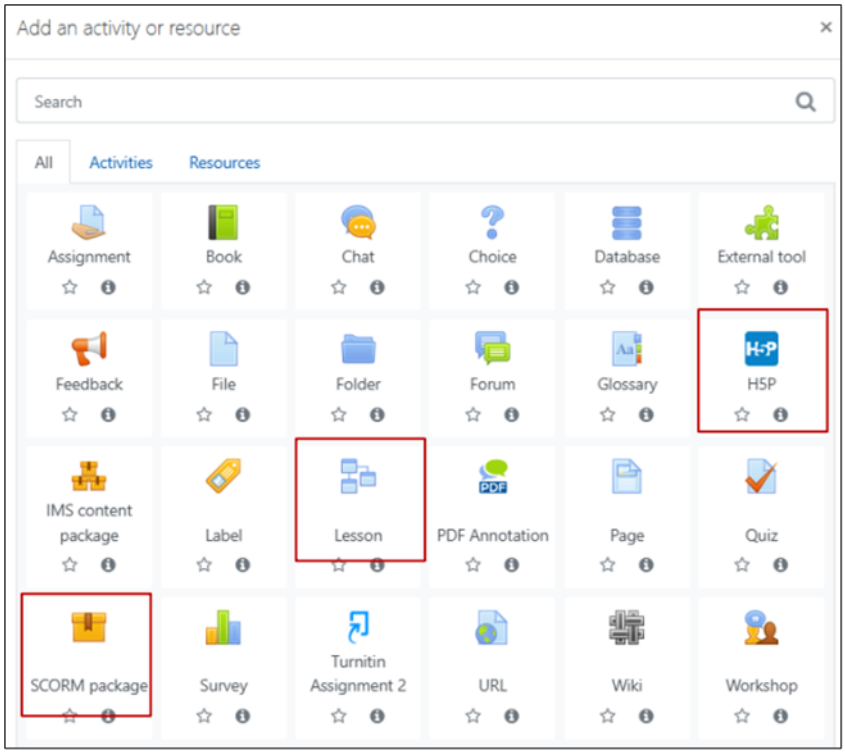

Fig. 6. Available tools and resources within current LMS at MNU

From Fig. 6, it can be observed that tools like H5P and SCORM packages can be used within the LMS to create different types of interactive content. Furthermore, it also has an integrated Lesson tool that allows the creation of learning pathways based on learners' progress. It further allows the integration of other plug-ins that could enable the creation and presentation of adaptive content. Additionally, since Moodle is an open-source LMS, it can be easily modified to implement advanced features customized based on institutional preferences. However, it seems that lecturers and relevant personnel do not use these tools to provide different learning experiences for learners. This is evident from the responses of lecturers and instructional designers, who acknowledge a lack of skills and the need for professional development.

Overall, the current LMS at MNU does not implement personalized learning and follows a traditional one-size-fits-all approach, providing the same static content for all learners regardless of their learning preferences. This is a major issue discussed in the literature related to the failure of e-learning. Hence, there is a significant need to implement personalized learning concepts through the development of adaptive e-content. The LMS at MNU supports such implementations, and it is crucial to advance towards providing higher levels of personalization autonomy to learners using the available technological tools within the Moodle LMS.

VII. Conclusions and Recommendations

The paper presents findings from a study conducted to determine the needs for effective implementation of personalized e-learning at The Maldives National University (MNU), based on their current state of e-learning implementation. It is evident that the current e-learning environment at MNU follows a traditional approach, providing uniform learning materials for all learners regardless of their preferences. This is a major concern that contributes to the failure of e-learning systems. Therefore, there is a significant need for implementing adaptive techniques within the e-learning environment to provide personalized learning experiences for online learners. This would also help sustain the quality of teaching and learning practices.

The study, guided by Activity Theory (AT) and the Personalized Learning Design Framework (PLDF), allowed for a holistic analysis involving relevant stakeholders, technological tools, and measures of performance based on learner satisfaction levels. The results revealed that MNU strategically supports personalized learning through relevant policies and procedures. Similarly, lecturers and instructional designers, who are key personnel in

providing learning experiences for online learners, favor implementing personalized learning. Even the current LMS supports the implementation of adaptive techniques. However, due to a lack of knowledge, effective strategies, and support, these techniques are not implemented. Learners are also dissatisfied with the uniform content provided and the e-learning environment's lack of options and personalized features based on their preferences. This indicates a necessary need for developing and implementing adaptive content tailored to learners' needs, providing customized learning paths based on their preferences. Similarly, lecturers and instructional designers need guidelines and best practice approaches for such implementations.

Based on the findings, the following considerations are recommended to cater to the needs for implementing an effective personalized e-learning environment at MNU:

1. LMS should offer personalized content based on learner needs
2. The e-learning environment should target at least Level 3 of personalization where learners have some choice – they are given some control over their learning by selecting from options or working within parameters across learning path in addition to goals, time, place or pace
3. Should address the criticism of learning style and work towards dynamic approaches to customize the changing needs of learners over time using learning analytics through LMS.
4. A guideline or framework for adaptive content development and Moodle implementation should be provided for lecturers and instructional designers

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