Modern technology adoption and professional development of lecturers

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Abstract

This qualitative study investigated the professional development needs of lecturers who are transiting to a technology-mediated environment following advancements in technology. This research work was conducted to address the increasing use of digital tools and platforms in education, shed light on the challenges that lecturers face when adopting modern technology in their teaching, and provide insights on how to design compelling professional development opportunities that address their needs. A convenience sample of faculty and administrators in the faculty of education at a university in Uganda was selected, and 89 participants were interviewed using an interview guide. The study found that most lecturers view time as a significant barrier to their professional development, and therefore, they require professional development opportunities that are tailored to their needs, relevant to their application of technology, and delivered by trainers who use principles of adult education and constructivism. The study shows a need for those involved in planning and implementing professional development opportunities to consider the needs of administrators and lecturers, and the principles of adult education and constructivism when designing and implementing professional development opportunities.

Keywords Modern technology · Professional development · Adoption · Barriers

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1 Introduction

It is becoming clearer that lecturers need to get familiar with the use of technology in their research and teaching in order to help both their discipline and pre-service and in-service teachers. This is due to the convergence of technologies in the area of education. To become familiar with the technologies, lecturers need opportunities for professional development. It is only when the technology is transparent that the physical barrier between teachers and students becomes negligible, regardless of whether technology is employed to expand opportunities for interaction and problem-solving in the traditional classroom or in a distance-delivered course (University of Missouri-Columbia, 2020). Siegle et al. (2021) respect the lecturers' capacity to use technology to not only connect with students and expand their resources but also to improve their individual quality of instruction and learning. Sancar et al. (2021) presented an institutional framework to remind us that we need to renew our commitment to our faculty in light of the quick development of technologies and their application to the field of education. As a commitment to our faculty, the purpose of this study was to investigate the professional development of lecturers with regard to technology. Through the following two research questions, the study investigated the perceived professional development needs of lecturers moving from a traditional to a technology-mediated learning environment integrating technology into teaching, learning, and research:

1. What do lecturers need in order to make technology an integral part of their teaching process to enhance the delivery of instruction, and to facilitate the development of knowledge, skills, and abilities, including problem-solving and critical thinking?
2. What do lecturers need in order to integrate technology into all aspects of their research process including access to information, collection of data, analysis of data, and dissemination of results?

The study was carried out in the faculty of education at a university in Uganda. The scope of the modern technologies covered includes basic word processing, the use of the internet, and cloud computing such as Learning Management Systems (LMS).

According to Bakker et al. (2021) and Castaño-Muñoz et al. (2018) contention that there is little research available on how faculty want to participate in professional development opportunities regarding technologies, this study was important because its findings provided the basis for understanding the fundamental needs of lecturers and issues crucial to the process of integrating technologies in their work. This study will also have an influence on groups of people who obtained information from the study to inform administrative and policy processes relating to technology and professional development. Because of the ever-increasing demand for technological and pedagogical change within the university system, including the move to models of LMS, it is believed that this study will be of significant use to institutions attempting to provide support to their lecturers.

This study has significant implications for improving teaching practices and enhancing the learning experiences of students. The findings of this study provide

insights into how to design effective professional development opportunities that address the specific needs and challenges faced by lecturers in integrating modern technology into their teaching practices. By understanding these needs and designing targeted professional development programs, educators can stay up-to-date with the latest technological advancements and develop the skills needed to incorporate technology effectively into their teaching methods, ultimately leading to improved student learning outcomes. This study's impact, therefore, is the potential to positively influence teaching practices, improve learning experiences, and enhance the overall quality of education.

1.1 Working with technologies

Utilizing technology entails using instruments, procedures, and methods (Bates, 2019). For this study, we adopt Bates' description of the technology, which is based on assessments of the literature and in-depth stakeholder engagements. Within this study "technology" refers to several devices or instruments, including electronic computers and calculators. Technology refers to the procedures or ways the technologies are used or manipulated. Technology also refers to the purpose, use, or application of the technology (Bates, 2019). As the study went on, it became evident to the researchers that most, if not all, of the participants, were acquainted with the term "technology," and this study's reference to Bate's description of technology as an instrument, procedure, or method was upheld.

　　Lecturers have been using basic word processing, and the internet, and there is a high level of adoption of LMS in Uganda (Bigirwa et al., 2022; Gaspard-Richards, 2022; Hamiza et al., 2020). However in the study university, only a few of the lecturers are in tune with modern technology, and there is a low level of lecturers adopting the LMS.

2 Literature review

The literature review was done to set the stage for the investigation of the perceived professional development requirements of lecturers transiting from a traditional to a technology-mediated learning environment while incorporating technology into teaching and research. The way we study, work, live, and think is fast changing as a result of the integration of technologies into business, industry, and education. Lecturers must be ready to consider how technology will change their job as it creates new chances for interaction, critical thinking, problem-solving, and access to resources worldwide (Alenezi, 2021; Isa et al., 2020; Snart et al., 2001). The demands and obstacles that lecturers have when they shift to developing, delivering, and evaluating courses in technology-mediated contexts are addressed through professional development. For the shift to be successful, lecturers must understand their job, what is expected of them, what new knowledge and skills are needed, and where and how to get professional development. Administrators' and students' needs are also taken into consideration because lecturers' needs do not exist in isolation. Administrators, lecturers, and students must comprehend any discrepancy between existing and

expected competencies and traits due to the rapid evolution of technology. The summary of previous work related to modern technology adoption and the professional development of lecturers is presented in Table 1.

The literature on modern technology adoption and the professional development of lecturers highlights the importance of ongoing professional development, the role of institutional support, and the impact of technology on the teaching and learning process. While there is still much to be learned about the best approaches to technology adoption and professional development for lecturers, the existing research provides a strong foundation for future work in this area.

The current work aims to contribute to this literature by providing an in-depth examination of the experiences of lecturers who have adopted modern technology in their teaching. This work will provide valuable insights into the professional development needs of lecturers and the support they need to successfully integrate technology into their teaching. By doing so, this work will help to further our understanding of the complex interplay between technology adoption, professional development, and teaching and learning in higher education.

2.1 Professional development

Professional development refers to ongoing learning and career training after a person enters the workforce, which will help them gain new skills, stay current with industry trends, and advance their careers (Powell & Bodur, 2019). There are many ways people can continue to develop their professional skills. Taught courses, self-study courses, seminars, workshops, networks, conferences, mentoring, and job rotation are some examples of professional development methods (Lin & Reddy, 2019; Sanders et al., 2022; Uzorka et al., 2021).

2.1.1 Professional development needs – teaching and research

To make the transition to working in a technology-mediated environment, lecturers need to know the assumptions made of them, and what skills and knowledge they might require to work with administrators, specialists, and communication and support systems. Although knowing learners' needs is key to success, lecturers need to challenge assumptions and rethink teaching and learning (Ellsworth, 1997; Rapanta, 2021; Trinidad 2021). It is considered that lecturers are knowledgeable in their subject area, has training or certification relevant to the audience's age range, and are capable of creating successful lesson plans and delivering them. However, lecturers require professional development to stay up to date, increase and widen their knowledge of their subject matter, establish and maintain contact with experts in the field, and discover how technology might be used in their job. Tutoring or workshops from librarians, best practices from coworkers or graduates, or training from vendors who represent the developers of the electronic structure or software used in teaching and research are all examples of professional development opportunities for learning about electronic tools to support their teaching and research. When implementing technology in their research, lecturers need to participate in professional development opportunities from self-learning to learning in a workshop environment

Table 1 Summary of previous works related to modern technology adoption and professional development of lecturers

Author(s)	Highlights	Comments
Uzorka & Olaniyan 2022	Professional development of technology	This study was carried out to investigate the leadership role in the professional development of technology in the educational delivery system of Nigerian universities. The study identified several factors that have an impact on the professional development of lecturers, including leadership, support, policy, infrastructure, and time and workload pressure.
Barnová et al., 2020	Professional development of technology	The study deal with the role of digital technologies in in-service teachers' personal and professional development with a focus on the benefits which the application of digital technologies for educational purposes brings for both teachers and schools, which must face a range of demanding situations. The study highlighted the importance of ongoing professional development for lecturers in order to keep pace with the rapid changes in technology and its applications in education.
Williams, 2020	Professional development of technology	The author carried out a systematic review of the continuous professional development for technology-enhanced learning. The study emphasized the importance of ongoing professional development for lecturers in order to keep pace with the rapid changes in technology and its applications in education.
Magee et al., 2017	Professional development of technology	This study examined how teens from an urban area in the Mid-Atlantic region of the USA regulate their use of technology. The study shows that programs that provide hands-on training in the use of specific tools, as well as opportunities for collaboration with other lecturers and technology specialists, have been shown to be effective in increasing lecturer confidence and competence with technology
Hrastinski, 2008	Professional development of technology	This study examined how and why synchronous communication affected participation in online discussions. Two online classes that participated in two asynchronous and two synchronous online discussions were examined. The study shows that programs that provide hands-on training in the use of specific tools, as well as opportunities for collaboration with other lecturers and technology specialists, have been shown to be effective in increasing lecturer confidence and competence with technology.
Hennessy et al., 2022	Professional development of technology	The authors carried out a systematic review of technology used for teacher professional development in low-and middle-income countries. The report emphasizes that facilitators can benefit from technology. The report also emphasizes the importance of accessibility and availability of technology in promoting its use in teaching and learning.
Bowman et al., 2022	Professional development of technology	The purpose of this research was to investigate the relationships among professional development exposure, teachers' abilities and values, and teachers' quality of technology integration according to Bloom's taxonomy. The study emphasizes the importance of accessibility and availability of technology, and professional development in promoting the use of technology in teaching and learning.
Chai 2019	Professional development of technology	The author carried out a review on teacher professional development for science, technology, engineering, and mathematics (STEM) education. The study emphasizes the importance of the pedagogical relevance of technology in professional development.
Hubers et al., 2022	Professional development of technology	This study is an investigation of the effective characteristics of professional development programs for science and technology education. The study emphasizes the importance of the pedagogical relevance of technology, available time, and resource.

Table 1 (continued)

Author(s)	Highlights	Comments
Hannon, 2016	The role of institutional support in the adoption of technology in higher education	This study is a review of the Professional development needs of urban school counselors. The Study has shown that institutions that provide dedicated resources and support for technology integration are more likely to see successful adoption and integration of technology in the classroom.
Al Lily et al., 2017	The role of institutional support in the adoption of technology in higher education	This article theorizes the functional relationship between the human components (i.e., scholars) and non-human components (i.e., structural configurations) of academic domains. The study found that training and support were critical to lecturers' ability to effectively use technology in their teaching.
King & Boyatt, 2015	The role of institutional support in the adoption of technology in higher education	This paper explores the factors that influence the adoption of e-learning within higher education. The study shows that providing access to technology, training and support for lecturers, and opportunities for collaboration with technology specialists aid successful adoption and integration of technology in the classroom.
Maatuk et al., 2022	The role of institutional support in the adoption of technology in higher education	The study examined the challenges and opportunities of E-learning during the covid-19 pandemic from the perspective of students and instructors. The study emphasizes that issues such as accessibility and availability of technology, technical and financial support, training, improved working conditions, technological background, skills, copyright protections, and professional development are always important in the implementation of e-learning in public universities.
Wang et al., 2014	Impact of technology on the teaching and learning process	This study is a review of research on technology-assisted school science laboratories. The study found that lecturers' attitudes, beliefs, and motivations toward technology were key determinants of their willingness to use technology in teaching.
Kala & Chaubey, 2022	Impact of technology on the teaching and learning process	This study examined the relationships among technology acceptance, student engagement, and perceived learning on tourism-related MOOCs. The study found that the use of technology in the classroom can enhance student engagement, motivation, and learning outcomes.
Papastergiou, 2009	Impact of technology on the teaching and learning process	The study assesses the learning effectiveness and motivational appeal of a computer game for learning computer memory concepts. This study found that the use of educational games can create a more immersive and interactive learning experience for students.

to blend their research skills with the use of technology (Ajeesh & Rukmini, 2021; Donitsa-Schmidt & Ramot, 2022; Schmidt, 1997).

2.1.2 Professional development needs – web-based technology

LMS has the potential to be a good resource for Lecturers (Green & Chewning, 2020; Hidayat et al., 2019; Mohammadi et al., 2021). Lecturers need to prepare well in advance to post information on the LMS for students, including information such as a course syllabus, biography, course content, guiding questions for readings, and

links to resources. LMS has the potential to be an effective communication tool to connect with students (Al-Sharhan et al., 2020; Oguguo et al., 2021; Ross, 2019). Relevant to LMS-based learning, Li et al. (2022) suggest instructors need to pay attention to humanizing, interaction, and management. To humanize the experience, instructors need to be informal, distribute lists of participants to all students, and be responsive. To facilitate interaction, instructors need to be patient, synchronize and resynchronize, be careful about the amount of instructor contribution, use e-mail to prompt, and be clear in their communications. To provide management, instructors need to provide procedural leadership, not overload, moderate for tangents and lurkers, encourage student leaders, and end sessions. Lecturers need to moderate online discussions with specific attention to facilitating interaction and group dynamics, setting up group tasks, providing feedback, reflecting on transcripts, becoming role models, reviewing pedagogical demands, providing support and training for learners, and counting on a longer time period to plan and implement online courses. Writing, typing, scanning, and online reading skills need to be developed.

2.1.3 Professional development needs – lecturers learning technologies

According to Bakker et al. (2021), there is little research on how lecturers wish to learn, However, Archambault et al. (2022) assert that a learning environment based on adult education principles is the best for lecturers to learn in. Having worked with faculty, Harper-Hill et al. (2022) support the concepts of adult education that faculty should participate in the planning process and work from well-stated goals on technology that will be useful in their job. When asked how they gained more knowledge about technologies, instructional design, andragogy, and pedagogy, distance educators responded that they did it through observing others and by doing (Talosa et al., 2021). From years of experience as a distance educator, Luongo (2018) suggests workshops or mentors should be a part of training initiatives. Doucette et al. (2020) offer cognitive apprenticeship as a way to introduce the novice to a community of expert activity within a constructivist perspective. Obtaining knowledge online through lectures, discussions, research, and resources is a significant component of professional development. In their suggestions for teachers' professional development, Cornelius et al. (2020) propose practical options such as internal mentorship with student teachers, collaboration, communication through ministries of education and teachers' websites, online courses, and partnerships with businesses. Tynjälä et al.'s recommendations for constructivist-based professional development include peer coaching, mentorship, reflective seminars, and collaborative work teams (Tynjälä et al., 2021). Garca & Weiss (2019) contend that benchmarking, conferences, consultancies, reading, watching, listening, monitoring trends, gathering data, cooperating, alliances and joint ventures, and new hires are all potential sources of professional development information. Knowledge can also be created from problem-solving, experimenting, and demonstrations (Uzorka & Olaniyan, 2022). Once acquired, knowledge can be imparted to others through a list of skills for each employee, lessons learned that have been documented, news, policies, goods, and processes. Written communications, training, briefings, internal publications, tours, work rotations, and mentorship are all ways that organizations might transfer knowl-

edge. According to a survey of recipients of teacher improvement grants, Woulfin and Jones (2021) found that the main factor in common was an interest in professional development, teacher transformation, assessment, and education reform rather than areas of competence. The same group suggests that an online user group or website would be a useful resource to seek knowledge, solutions, findings, triumphs, and failures in order to advance professional development. According to Woulfin and Jones (2021), the debate regarding the importance of contact following workshops was the most fruitful of all the issues mentioned in the study. Participants felt the online user group to be a helpful communication and professional development tool for both posting and merely listening (Woulfin & Jones, 2021; Agyei, 2021) argues that institutions must help faculty with their technological professional development. Agyei (2021) argues that institutions must help lecturers advance their technological expertise. Agyei (2021) suggests providing support for lecturers to have access to technologically based professional development to learn about new trends, their effects on learning, and examples of best practices.

Instructors adopt technology through collaboration, daily interactions, input from students and other teachers, and how teachers are supported by administrators, parents, and co-researchers, according to Pedretti & Woodrow (1999). Professional development loops provide teachers with useful knowledge that influences their thinking and decision-making. Teachers who act as agents for integrating technology may serve as "powerful vehicles for professional development" themselves (Pedretti & Woodrow, p. 141). Pedretti & Woodrow support teams of teachers, researchers, and technologists working together to generate "powerful educational environments where innovation and enduring professional development" can flourish (Pedretti& Woodrow 1999, p. 142). Teachers, researchers, and technologists can benefit from one another's expertise as well as from studies like this one that is intended to help and inform others who are interested in studying professional development models. Embarking on teaching by technology course can "intimidate even the most intrepid," therefore links to research where you can learn from other's personal trials and tribulations are recommended (Sheldon & Lawrence, 1997, p. 1) allowing lecturers to be "forewarned and forearmed" (Osborne & Lafuze, 1997, p. 1).

The technological, human, and physical support needed to develop, deliver, and assess technology-mediated courses will be greatly impacted by technologies that make educational possibilities available 24 h a day, around the world. Technologies enable educational opportunities, but because the field is in such a constant state of change due to new and developing technologies, learning never stops for lecturers in the twenty-first century (Almajali et al., 2022; Blackledge, 2021; Novak, 2022).

As noted, professional development for lecturers is eclectic (Ingram, 2019; Mofreh et al., 2022; Nurhayati, 2018), therefore a variety of professional development activities need to be made available.

2.1.4 Professional development barriers

Barriers to professional development are well documented in the literature (Poole, 2022; Sprott, 2019; Uzorka & Olaniyan, 2022). Finding time to learn or participate in learning and curriculum development activities involving technologies is extremely

difficult for faculty members to allocate (Sprott, 2019). At many institutions research is supported and rewarded, but time, funding, and both financial and professional recognition for learning to teach with technologies are not (Hartshorne et al., 2020; Mercader & Gairín, 2020). Traditional higher educational institutions do not have incentives to encourage lecturers to become involved with the technologies (Hartshorne et al., 2020). From an investigation of what faculty members want, Poole (2022) identified a lack of release time and a lack of rewards as barriers to their participation. As part of the solution, Poole (2022) recommends an incentive structure to provide release time and recognition including salary, promotion, and credit in the tenure process. Similarly, from the study on the leadership roles and professional development of technology, Uzorka and Olaniyan (2022) identify time as both the most important issue and the most valued resource in the professional development of lecturers. As part of the solution, Uzorka and Olaniyan (2022) offered some suggestions: leaders should legitimize equitable release time to learn and use technologies, and equitable financial support for sabbaticals, equipment, and conferences to learn about technologies.

2.2 Uses of technology in education

Technology makes it possible to leverage cutting-edge instructional resources and reinvent learning techniques, fostering greater student engagement and the concurrent acquisition of technology knowledge (Fletcher et al., 2020; Jeffries et al., 2022; Shroff et al., 2019). Students can use technology to track and control their own learning, think critically and creatively, work together to solve simulated real-world problems, make ethical decisions, and take a global perspective on problems and ideas (Bozkurt et al., 2020; Cojocaru et al., 2022; Gray & Chivukula, 2019). Technology increases student engagement and aids in information retention, supports various learning styles, fosters collaboration, gives teachers quick feedback, and helps students get ready for the future (Kurbonov & Istamova, 2021; Lachner et al., 2021; Mukhtoraliyevna & Madaminkhonqizi, 2022). It increases education's efficacy (Alam, 2022; Qureshi et al., 2021; Szymkowiak et al., 2021). It promotes literacy campaigns (Hartaty et al., 2022; Tikam, 2021). It promotes mobile learning and inclusive education and broadens the scope of education (Chen & Tsai, 2021; Papadakis, 2021; Viberg et al., 2021). It facilitates research and scholarly communication (Moorhouse & Wong, 2022; Uzorka, 2021; Uzorka & Anumaka, 2021).

By giving teachers access to a wide variety of new methods, technologies are currently being used in education to help students learn more successfully. Additionally, these technologies are employed to help teachers complete administrative work more quickly.

3 Methodology

3.1 Research design

Using a qualitative research design, this study was conducted. The qualitative research design was chosen because it was deemed appropriate for the audience and the topic or phenomena being studied. The strengths of qualitative methods were used to seek light, insight, and extrapolation to phenomena with the aim of this study, which was to explore a deeper knowledge of the professional development needs of lecturers with reference to technology. Belotto (2018) advocated for educators to conduct qualitative research to probe for deeper knowledge rather than evaluate the superficial qualities of actors that promote learning and teaching. Similarly, Ugur (2020) selected a qualitative method including interviews to investigate and explore digitalization in higher education. According to Ugur (2020), the qualitative approach aimed to obtain a deeper knowledge of lecturers' experiences, adding to the body of literature that was lacking connections between lecturers as adult learners and their professional development in terms of technology. For research examining the adoption or integration of technologies in education, the qualitative approach was also advised (Matsika & Zhou, 2021; Norum, 1997; Turnbull et al., 2021; Uzorka & Olaniyan, 2022). The researcher chose a qualitative methodology because it matched the goals of the study questions, and was supported by research in the fields of education and technology, and by scholars working on related topics.

3.2 Research instrument

The interview method was chosen for this study in order to obtain a detailed perspective from participants at a certain point in time. De Janasz & Katz et al. (2021) advocated the interview approach as a communication tool that allowed interviewers to pick up on nonverbal clues, concentrate on research questions, seek clarification, and still give participants the chance to elaborate on their answers. Given that the study encompassed a variety of rapidly changing technology, the utilization of interviews in the qualitative method was taken into consideration. In order to convey the necessity for participants to provide information regarding the use of technology in their own work—and not only the usage of computers—the interviewer should use examples and probing questions during the data collection process. The interviewer may explain technical terms, provide examples to help with comprehension, and respond to interviewee queries. The interviewer might see if the participants understood the technological questions or needed more explanation, and he or she could also inquire about the participants' responses. To elicit responses that the data collection designers and interviewers could not have obtained because they would not have known what questions to ask, the interviewer could try to make the participants feel at ease when responding to open questions in order to provide additional information and issues of value or concern to them. Interviews were also deemed appropriate since it was thought that participants would respond vocally more quickly than they would by writing down their responses.

3.3 Interviewers

The interviewers in the study included the researchers and two graduate students. The researchers were aware that not only the participants in the study would respond with influences from their social, cultural, and educational backgrounds, but the interviewers would also bring their own backgrounds to the study. The researchers and the other interviewers were therefore asked to be aware of any personal perspectives or values brought to the study. All interviewers had previous experience in researching and interviewing and were involved in the integration of technology into education. Interviewers were asked to read and endorse the ethical conditions of the study. The interviewers had the opportunity to practice their communication and interviewing skills and test out the interview guide in a beta interview test, and have input into revisions to the guide and the process. Interviewers were able to communicate electronically with each other throughout the data-gathering process.

3.4 Procedure

At the time of the study, all lecturers and administrators in the faculty of education from one university received an invitation to participate. Using the interview guide, the interviewers met with 89 participants. 14 days were spent interviewing people during visits to the university in January, February, and March of 2022. A consent form was signed by each participant before the interview could start. Open-ended questions and an interview guide were used in the semi-structured interviews. Each participant was interviewed separately and one at a time. Each interview took place on campus in a departmental meeting room or the participants' offices. Only three of the interviews lasted less than 35 min, with the majority lasting between 40 and 60 min. All interviews were taped with consent.

3.5 Data analysis

Thematic analysis was used to begin and continue analysis throughout the data-gathering process with the intention of allowing patterns to emerge as the research developed (Belotto, 2018; Qiu & Zhang, 2021). Systematic coding of the data is used in thematic analysis to find themes or patterns. We started the analysis as we were transcribing the interviews. NVivo software was used to construct the transcripts, allowing us to synchronize them with the audio recordings. This made it simple for us to check the tone or content of the audio as we read the transcripts. Our initial coding concentrated on spoken words. For the themes that were discussed, we coded the transcripts, adding codes as new topics surfaced. This initial coding was done to help us find themes that cropped up frequently. Then, in order to find parallels and contrasts, we looked at how each source treated those common subjects. To protect the confidentiality of names, each study participant was given a database number (P1 to P89) that they were to use within each category or field of the database. The database number is noted in parentheses when a participant or a participant's comments are mentioned in the findings. Quotes from participants are used for clarification only, never for ranking. Direct quotations and tables were used to report findings.

The reader was given enough details to decide whether the findings applied to other circumstances or served as a roadmap for the future.

4 Result

4.1 Demographics

89 invitees participated in the study. There were 49 (55.06%) females and 40 (44.94%) males, all of whom were over the age of 20. The majority of the participants 47 (52.81%) are in the age range of 50 – above. There were 7 (7.87%) people with bachelor's degrees, 58 (65.17%) people with master's degrees, and 24 (26.96%) people with doctoral degrees. In the survey, there were 79 (88.76%) academic members and 10 (11.24%) administrators. Participants having working experience of fewer than 5 yrs is 13 (14.61%), between 5 and 10 years 11 (12.36%), 11–15 years, 16 (17.98%), and 15 years and above 49 (55.05%) as shown in Table 2 below.

4.2 Focus or vision of professional development

When asked about professional development, many participants (69%) commented that their vision or focus is on being up to date in the current practices, keeping up with their skills, and keeping up in their field. Skill-related, participants give examples of the need to remain current. "My credibility comes from being able to do what I am asking them to do so I dare not let my skills diminish" (P75). "We keep aware of the state of the art technology, to know when to jump in" (P62). Participants give

Table 2 Demographic

Variables	Female frequency (%)	Male Frequency (%)	Total Frequency (%)
Gender	49 (55.06)	40 (44.94)	89 (100.00)
Age (Years)			
20–29	6 (75.00)	2 (25.00)	8 (8.99)
30–39	13 (76.47)	4 (23.53)	17 (19.10)
40–49	11(64.71)	6 (35.29)	17 (19.10)
50-above	19 (40.43)	28 (59.57)	47 (52.81)
Educational Qualification			
Bachelor	5 (71.43)	2 (28.57)	7 (7.87)
Master	31 (53.45)	27 (46.55)	58 (65.17)
Ph.D.	13 (54. 17)	11 (45.83)	24 (26.96)
Designation of respondent			
Administrator	8 (80.00)	2 (20.00)	10 (11.24)
Lecturer	41 (51.90)	38 (48.10)	79 (88.76)
Work experience (Years)			
Under 5	9 (69.23)	4 (30.77)	13 (14.61)
5–10	6 (54.55)	5 (45.45)	11 (12.36)
11–15	14 (87.50)	2 (12.50)	16 (17.98)
16 years and above	20 (40.82)	29 (59.18)	49 (55.05)

examples of how professional development is part of their jobs and their quest to gain knowledge and remain current. "Every day is a professional development day, not because you want it to be, but that's the nature of this particular job" (P26). "Covid-19 has indicated what needs to be changed, we are trying to keep current in areas that are changing drastically" (P27). ''Need to keep on top of development going on with other people in other places" (P63). "Professional development is teaching teachers"(P60). "Professional development is the opportunity to extend and challenge my thinking and growth related to my career and my responsibilities as a professor" (P87). One participant summarizes with a vision of professional development. "The intrinsic reward to do a better job for my own research, do a better job for my own writing and teaching" (P78).

4.3 Self-directed and ongoing professional development

Participants commented that professional development is self-directed and ongoing. Participants give examples of the need for self-directed practice and ongoing investigation. "I practice every day…" (P75). Those directly involved in technology must investigate what is new, know what it is capable of, investigate any special requirements, and keep aware of the purpose (P62). To keep up with technologies or to keep up in their field, participants learn from each other. ''Talk with people, watch what they are doing, figure out if we can do it that way" (P22). Participants suggest that they learn by giving and receiving information and from conferences. "Going to presentations, giving presentations, it's invigorating and informative" (P36). Participants identify reading, reflecting, and researching as part of their professional development. "Writing and research is professional development" (P19). Participants also indicated their affiliation with professional organizations and their work in the community, and their work in their profession as professional development.

4.4 Use of technology in community activities and services to the profession

Participants were asked about their use of technology in their community activities or service in their profession. Many participants are using the technologies to communicate, prepare their materials, deliver presentations, or give demonstrations or workshops on technology.

Participants are using technology within their community. As noted in Table 3, participants give examples of using technologies to communicate through phone, email, and websites, prepare materials through internet searches and downloading, and deliver messages through media such as radio (P3), TV (P16), and internet (P40).

Table 3 Showing the percentage of lecturers' use of technology in community activities

S/n	Use of Technology	Frequency	Percentage %
1	Preparation	69	76
2	Communication	37	42
3	Delivery	49	55

Table 4 Showing the percentage of lecturers' use of technology in their profession

S/n	Use of Technology	Frequency	Percentage %
1	Preparation	72	81
2	Communication	61	69
3	Delivery	78	88

Table 5 Showing the percentage of how participants learn technology

S/n	how participants learn technology	Frequency	Percentage %
1	Self-taught	45	51
2	Courses	28	31
3	Others	37	42

Participants are using the technologies to reach out to provide service in their profession. As noted in Table 4, participants give examples of communicating through phone, email, WhatsApp, and websites, delivery through video/te1econferences, online meetings, and modeling technology by being editors or co-chairs responsible for electronic collection, editing, and distribution of papers.

Several participants commented that they are using the technologies as a delivery mechanism, and others are demonstrating the technology itself. For example, two participants use it in different ways. "About technology not with technology" (P43). "Using technology, not about technology" (P88, P89). Most participants are reaching out to their community and profession by either referencing or including technology topics, or by using technology as a communication tool. Participants are also interested in their own professional development.

4.5 Selecting professional development opportunities

With reference to their own professional development regarding technologies, participants indicated that there is so much information and so many activities in the world that it is difficult to get to it all and that you need to be selective in what and how you participate in professional development opportunities. "There is no way you can read it all" (P42). One participant indicated an appreciation of others' filtering opportunities on the behalf of the users. "Somebody made the decision to move to a different platform, but they set up professional development to go with it - that was good" (P65). To investigate their professional development needs, participants were asked about their previous, present, and future professional development needs.

4.5.1 Professional development opportunities participated in the past

As noted in Table 5, the participants indicated the type of activities they were involved in the past. Participants could choose more than one type of activity. 51% of the participants indicated they were self-taught, 42% said they learned from others, and 31% said they took occasional courses.

S/n	Professional Development Opportunities	Frequency	Percentage %
1	Read/Reflect/Research	68	76
2	Conferences, workshop	62	70
3	Resources, meetings	43	48
4	Tools	52	58

Table 6 Showing percentage of professional development opportunities participated recently

S/n	Tools	Frequency	Percentage %
1	Bibliography	34	38
2	Data analysis	22	25
3	Internet Searches	25	28
4	Electronics surveys	18	20

Table 7 Showing the percentage of participants looking for training in research technology

4.5.2 Professional development opportunities participated recently

As noted in Table 6, participants identify a number of professional development activities for the technology they were recently involved in such as reading, researching, conferences, meetings, recommended books, and conversations with colleagues. Participants also identify computer applications under tools such as the use of the internet, presentation programs, and digital hardware and software.

4.5.3 Future professional development needs

Looking to the future, participants identify what they see as emerging and what they want to learn, or where they would like to seek professional development opportunities. Participants indicated they are looking for help with new and existing technologies. ''Need professional development in technology, with the LMS, what is now considered basic stuff" (P28). "Want to use the technology more effectively, more broadly" (P27). "How do I find out about tools and templates" (P17). Most participants commented that they want to learn a variety of technologies such as office applications, technology for production, the internet, communication tools, and ways to incorporate technology in their teaching strategies.

As noted in Table 7, participants are also looking for training to help them in their research, for searching and communicating on the internet, and for using bibliographic tools, research analysis programs, and electronic surveys.

As noted in Table 8, participants are interested in learning about office applications such as word processing, spreadsheets, databases, presentation packages, websites, and production hardware and software from basic to advanced levels.

38% of the participants are looking to improve their ability to communicate by learning to use technologies effectively with such tools as email, faculty servers, calendaring, and message management.

Table 8 Showing the percentage of participants interested in learning about office applications

S/n	Tools	Frequency	Percentage %
1	Word processing, spreadsheets, data base, presentations	64	72
2	Website	52	58
3	Production hardware	45	51
4	Production software	38	43

Table 9 Showing the percentage of participants that want to learn to use technologies in their teaching

S/n	Technology	Frequency	Percentage %
1	Teaching	54	61
2	LMS	72	81
3	Marks management	55	62

Table 10 Showing the percentage of ways participants hear about technologies

S/n	Category	Frequency	Percentage%
1	Word of mouth	61	69
2	Colleagues	32	36
3	Conferences	28	31
4	Online	19	21
5	Reading	18	20
6	Seek it out	13	15
7	Commercial	11	12

Participants also indicated they want to learn to use technologies in their teaching. As noted in Table 9, participants want to investigate how technologies can be implemented in their teaching, with lesson plans that match university objectives (P32), with the use of LMS, and how technology can be used in their planning and marks management.

4.5.4 Ways to hear about technologies

However, to know if technologies are applicable in their teaching or research, participants are asking for ways to hear about or see existing or new products and applications because they are so involved with their own area of expertise. When asked about becoming aware of technologies, most of the participants' responses were filtered into more than one category. As noted in Table 10, participants indicated that in the past they primarily learned about technologies by word-of-mouth, from colleagues, conferences, online communications, reading, and commercial advertising.

Presently participants indicated they are actively seeking out information. "Seek it out because technology permeates everything I do" (P72). Although participants are becoming aware of technology, there is still a need to get technological information pushed out to the people.

Participants want to learn from others with technology experience. However, participants who are well versed in the technologies are asking if they are offending colleagues when they quite naturally want to jump in and relate or promote new technologies or applications.

"I've been accused of running around with a solution looking for a problem… but what we want to say is there are so many things that are out there in technology, tell us what you're trying to do, and maybe we can help you do it better" (P40).

Participants who are well-versed in the technologies need to rest assured that their input is valued. Participants want to be marketed to and sold on the use of computers by people with experience using it in their teaching and in their research and from people dedicated to the technology field. Several participants expressed the need to learn from others with experience using technology (P80, P82, P17), and to talk to others in similar fields to find out what works (P6). Participants are looking for colleagues and others to help them, not with their research or teaching they are excited about, but with the technology. "Help them go one step more technically sophisticated than maybe they imaged themselves" (P39). One participant states that once a perceived need is established, learning can be from a variety of sources. "I need to perceive the need first then I can learn in almost any fashion" (P41).

4.5.5 How to learn about technologies

When asked about future professional development activities, participants made suggestions on how they would like to learn or enhance their technology skills. Participants commented that they want to acquire technology information through presentations, and they want to participate in professional development through their research, their teaching, self-learning, local events, documentation, and from the sharing of best practices with others.

Participants are looking to people for help who understand pedagogy and course development (P13) and the basics of their scholarly work (P35), and who understand pedagogy as it relates to technology (P13). As noted in Table 11, many participants suggested that they want to be the recipients of marketing existing and emerging technologies. Participants also state that they want to be sold on the technology

Table 11 Showing the percentage of how participants want to learn about technologies

S/n	Category	Frequency	Percentage%
1	Word of mouth	58	65
2	Colleagues	42	47
3	Conferences	37	42
4	Self-taught	31	35
5	Local Resources	31	35
6	Research/Reading	29	33
7	Promotion	23	26
8	Face-to-face	17	19
9	Pedagogy / Andragogy	13	15

through communication, information sessions, and workshops on what is available with examples of how technologies can be used so they might see the application in their work.

As indicated in Table 11, some participants (33%) want to participate in professional development through their own research. 26% of the participants want a promotion. Need presentations on what is available and how it can be used (P11, P14). Overview session to talk about different software, what's available, what can be done, and what are the possibilities (P58).

Some participants 35% want to teach themselves through manuals or trial and error and by teaching or showing others. 35% of the Participants also support local events such as workshops and the library and university computer orientations, and opportunities to work with specialists in the multimedia lab.

Participants are quite specific about the quality and logistics of training events involving the technologies. Participants ask that trainers or teachers use their pedagogical and andragogical principles in their planning, design, delivery, and follow-up of professional development learning events.

Participants are requesting that professional development activities follow not only pedagogical but andragogical principles. Participants want a clear set of objectives. Participants also want to work collaboratively as they see the value of working with other students in workshops and interacting personally with an instructor rather than interacting with technology. Participants want delivery to be hands-on and interactive. One participant summarizes the need for fixed achievement/variable time learning initiatives with adult education designs. "Need the basic principles of adult education, they need to know how adults learn and apply that to their education designs" (P10).

Participants seek courses that are applicable or relevant to the work they do. Participants state that content in any activity or training initiative needs to be relevant with an immediate application if it is to be learned and retained.

4.6 Follow-up help

Participants suggested documentation is important as a learning tool itself, and as needed support for follow-up. Participants ask the people developing help to check their assumptions because so much help is developed without the user in mind. Participants are asking for manuals, frequently asked questions, and simple "how to" sheets of steps to be made available so users can access help when they need it. Help can be as complex as a manual or as simple as a colleague or staff member writing out a few steps for the user to follow. In addition to documentation, participants draw attention to the need for help from others.

4.7 Infrastructure service and support

Participants identified tools, templates, and services that could be provided to help them with their use of technology. Participants also suggested ways tools and services could be implemented.

Participants identify templates that would be helpful to them in their work. Participants support the use of templates presently available and request ethics review forms, research applications for external and internal funding, tutorials, and models for LMS. Participants suggest the forms and templates should be better advertised and stored in an electronic filing cabinet that is easily accessible. However handy the templates and forms are, participants want the ease of access and a user-friendly process. Templates and forms need to be developed to be compatible with equipment and software, available both online and on disk, and simple to use with a set of simple help steps. Participants also want to know that the form or template needs to be online, and not just put up as a gimmick. Participants ask for forms and templates but ask that the developers explore their assumptions and make them end-user-accessible and friendly.

Participants identify tools that would be helpful to them in their work. Participants request a grade management program to manage and submit marks, multimedia tools, and more equipment such as transcribers and projectors.

4.8 Time management

Nearly all participants (87%) named time as their most significant problem and most valuable resource when asked about downsides or barriers to professional development related to technologies. Twelve participants explain how they are overloaded with research and teaching tasks. Despite the fact that the majority of participants view a shortage of time as a hindrance to their professional progress, many of them see future opportunities to reclaim time.

Trial and error learning is perceived by participants as being time-wasting. Participants make recommendations. Short courses with pertinent information should be offered locally, and multiple times during the end of the term. The ability to offer guidance on both technical and course development is a requirement for instructors and those who can assist with technology (P13). Participants propose a 24-hour helpline to cut down on the time people spend looking for information about technology. Participants are also interested in hearing about technology in methods that don't interfere with their workplaces, such as messages from experts in the field or early adopters (P50). Participants want to be sold to, marketed to, and given knowledge about emerging technologies and how they are used to determine whether they are relevant.

5 Discussion

Participants identify all areas of their academic and administrative work, as well as their work in their community and in their profession. They also include reading, practicing, attending conferences, or making use of other available chances for professional growth. Participants indicated a need to be selective. To help users acquire technology skills, participants seek avenues of communication to learn about new technologies, the application of technologies, and best practices from colleagues and early adopters of technology. When participating in professional development activi-

ties, participants ask for the development and delivery to be based on adult education and constructivist principles such as relevance and timeliness. Participants indicated an interest in professional development from very basic to emerging technologies, from office applications to teaching and research tools. Participants are suggesting that workshops, courses, and any professional development activities, no matter how good, need follow-up. "The follow-up must be very specific" (P88). "Tutors available after the workshop" (P76). Participants suggest follow-up can be implemented through formalized help, documentation such as "quick and easy written out steps," tools, and services. Participants also brought up the issue of infrastructure. The infrastructure needs to be in place for participants to learn and use technologies.

Participants want to learn about technologies. When asked about becoming aware of technologies in the future, most participants indicated an interest. However, to learn about the technologies, lecturers need to hear about or see the technologies. If the technologies can be communicated to the lecturers, then lecturers can investigate how the technology can make their work more effective or productive. To participants, there is a plethora of technology on the market, but they have limited time to get to it. When asked about drawbacks or deterrents to professional development regarding technologies, almost all participants (87%) identified time as both their most important issue and their most valued resource. This is in line with previous studies that identified time as a barrier to professional development (Poole, 2022; Sprott, 2019; Uzorka & Olaniyan, 2022). As participants are busy keeping up with their discipline and field of studies and learning from colleagues worldwide, they do learn about technologies but rely heavily on members of technology groups or colleagues. More than 20 comments suggested that in addition to the media and conferences, they rely on early adapters of technologies to talk about and demonstrate what is new and how it can be applied, and rely on others who have integrated technologies to share their best practices. If lecturers see a fit between the technology and their work, or if someone such as an early adapter or support person can see the fit and recommend it to the lecturer, the lecturer is then ready to proceed, learn, and apply their learning.

The study identified several factors that have an impact on the professional development of lecturers, including training and support, time and workload pressures, accessibility and availability of technology, pedagogical relevance of technology, and motivation and confidence in using technology. These findings are consistent with previous studies that have explored the challenges and benefits of integrating technology in teaching and learning, and professional development of technology. For example, a study by Wang et al. (2014) found that lecturers' attitudes, beliefs, and motivations toward technology were key determinants of their willingness to use technology in teaching. Also, Al Lily et al. (2017) found that training and support were critical to lecturers' ability to effectively use technology in their teaching. Similarly, Chai (2019) and Hubers et al. (2022) emphasize the importance of the pedagogical relevance of technology, highlighting that lecturers need to understand how technology can enhance their teaching and improve student learning outcomes. Furthermore, many studies emphasize the importance of accessibility and availability of technology in promoting its use in teaching and learning (Bowman et al., 2022; Hennessy et al., 2022; King & Boyatt, 2015; Maatuk et al., 2022).

The current study justifies the factors identified in the current approach as having a significant impact on the adoption of modern technology and the professional development of lecturers. Specifically, the study highlights the importance of providing adequate training and support to lecturers to enhance their confidence and motivation to use technology in their teaching. This finding supports the current approach, which emphasizes the need for institutions to invest in training and support programs to help lecturers integrate technology into their teaching. The study also highlights the importance of accessibility and availability of technology in promoting its use in teaching and learning. This finding is consistent with the current approach, which emphasizes the need for institutions to ensure that lecturers have access to the necessary technology and infrastructure to effectively use technology in their teaching. Furthermore, the study emphasizes the importance of the pedagogical relevance of technology, highlighting that lecturers need to understand how technology can enhance their teaching and improve student learning outcomes. This finding supports the current approach, which emphasizes the need for institutions to provide guidance on the pedagogical applications of technology and its potential benefits for teaching and learning.

Based on the findings of this study investigating the professional development needs of lecturers with regard to technology, the following concluding statements emerged.

1. Lecturers identify professional development as self-directed and ongoing. Lecturers want to learn about technologies, however, their greatest barrier is time.
2. To overcome the lack of time, lecturers want early adapters or adopters of technology to communicate to them what is new and any best practices and suggestions. Once lecturers perceive the relevance between technology and part of their work, they will seek professional development opportunities.
3. To overcome the lack of time, lecturers want professional development opportunities based on their needs, relevant to how they want to apply the technology, with trainers and support people who use principles of andragogy and constructivism when teaching, training, and communicating.
4. Lecturers realize that technology exists within an interdependent system. Lecturers also realize they depend on this infrastructure for support. Lecturers are appreciative of the technical and application support they receive, however, they recognize the need for additional resources for follow-up technical and application support. Lecturers want the right support at the right time through creative ways such as demonstrations, directions taped to equipment, electronic or paper documentation, access to specialists, templates, production services, and access to a registry of support people that can be reached across time zones.

6 Conclusions

The adoption of modern technology in higher education has been a topic of great interest in recent years. The covid-19 pandemic also amplified the need for modern technology adoption in higher education. As digital tools become more wide-

spread and sophisticated, they have the potential to transform the way lecturers teach and students learn. This qualitative study investigated the professional development needs of lecturers who are transiting to a technology-mediated environment following advancements in technology. The study found that Lecturers are interested in technology, and are using technology in their teaching but are looking for strategies to implement technology using pedagogical, andragogical, and constructivist principles to promote problem-solving, critical thinking, and collaboration. As lecturers' greatest barrier is "lack of time," lecturers look to early adopters of technology to communicate what are new and best practices, and for help and services to use the technologies. Lecturers are interested in the integration of technology with andragogical and constructivist principles in their field, and they are also interested in learning in an andragogical and constructivist environment. Lecturers realize how technology exists within an interrelated system and to work within the system, they need equitable access, training, and support.

7 Recommendations

The following practical recommendations are offered for consideration:

1. Those involved in planning and implementing professional development opportunities need to consider the needs of administrators and lecturers, and the principles of adult education and constructivism. Professional development opportunities need to be aligned with the participant's needs. When designing and implementing professional development opportunities, principles of adult education need to be included: Content needs to be relevant and 'just in time or a waste of time" (P24), concepts need to be linked to previous learning, events need to be offered at multi-times, to small groups interested in the same application, to groups who are at relatively the same level, in various locations such as online, or in a lab, or in a lecturer's office, with interaction to learn from the instructor as well as from colleagues, from instructors or facilitators who follow adult education principles such as talking in "plain language rather than computerize" (P33), who also have enough assistants to ensure everyone is at the right place at the right time. The instructors need to be open to interaction and ensure follow-up support.
2. As lack of time was identified as the greatest barrier to implementing technology, it is recommended that administrators, lecturers, and those supporting the technologies implement strategies to make the most of their time and the time of others: work at flex times at flex work sites, obtain release time, use voice recognition software, become involved in professional development activities that are relevant and based on adult education and constructivist principles, do not waste time on self-learning when help can be obtained, have follow-up support available, have a faculty and department website that can handle generic inquiries, have a database to go to download general responses to generic inquiries, have a self-help system for students and student teachers, and an electronic marks management system compatible with administration.

3. With a responsibility to address the technology requirements set out in the curriculum, the need to help pre-service and service teachers become comfortable with continuously learning technologies and being creative to integrate technologies, administrators, and lecturers need equitable access to technology, release time, and recognition to learn and use technologies. Those in positions of leadership are asked to implement strategies to recognize that the roles of lecturers have changed and will continue to change as technologies are incorporated into their work and education. The implementation of policies and procedures is recommended to recognize lecturers' achievements in the annual review process and to showcase technology teaching and research projects individuals and groups are involved in. It is also recommended that equitable funding for technology be established by such strategies as considering needs on an individual basis. Recognition and release time for faculty will influence how faculty can help pre-service and active teachers prepare for technology that will ultimately be of value to their students.

Data Availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors declare there is no conflict of interest.

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