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The Impact of Cognitive Psychology and Memory in ICT Utilization Among Female Academia in STEM Fields

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ABSTRACT

This study addresses how cognitive psychology and memory processes influence the adoption and utilization of Information and Communication Technologies (ICT) among female academia in Science, Technology, Engineering, and Mathematics (STEM) fields. As ICT continues to reshape academic environments, understanding the psychological underpinnings of its use becomes essential, particularly in underrepresented groups such as women in STEM. Using a mixed-methods approach, data were collected from 120 female STEM academia across five Nigerian universities through structured questionnaires and in-depth interviews. Results from the study show that higher cognitive load was significantly negatively correlated with ICT usage frequency ($r = -0.43$, $p < 0.01$), and working memory scores were positively associated with self-reported ICT competence ($\beta = 0.38$, $p < 0.05$). Findings reveal that cognitive factors such as working memory, self-efficacy, and cognitive load significantly impact ICT usage patterns. Moreover, age and academic rank moderate the relationship between memory retention and ICT proficiency. The paper recommends that cognitive-based training programs and institutional policies that support ICT competence and development, should be implemented in Higher Education Institutions for female scholars in STEM.

1. INTRODUCTION

Information and communication technology (ICT) integration in academic settings has radically changed the way knowledge is produced, shared, and applied in a variety of fields. In the STEM (science, technology, engineering, and mathematics) domains, where digital tools are now essential for research, instruction, and teamwork, this shift is especially noticeable (Guo et al., 2024). However, there are particular difficulties with ICT adoption and use among female academics in STEM fields, which call for careful examination from the perspective of cognitive psychology.

Due to a number of obstacles that go beyond traditional gender-based discrimination, such as difficulties in adopting technologies, women are under-represented in STEM fields, a persistent global concern (Ayeni et al., 2024). Developing focused interventions that can improve this population's technological competency and, in turn, their academic productivity and career advancement

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requires an understanding of how cognitive psychology principles affect ICT adoption.

A theoretical framework for comprehending how people process information, make decisions, and adjust to new technologies is offered by cognitive psychology. According to Suzuki et al. (2024), memory processes are crucial in determining how well people can acquire, retain, and apply knowledge pertaining to ICT use. Because it determines a person's ability to hold and manipulate information while learning new digital skills, working memory in particular has been found to be a crucial cognitive factor that influences technology adoption.

Additional information about how the human cognitive system processes information when interacting with technology can be found in Sweller's concept of cognitive load theory. This theory states that the amount of mental effort required in working memory during learning or task performance is referred to as cognitive load (Veinott, 2022). Learning and performance suffer when cognitive load surpasses a person's processing capacity, which may result in a decrease in the adoption and use of ICT.

The significance of comprehending cognitive factors in the adoption of educational technology has been emphasised by recent research. According to Nuangchalerm and Prachagool (2023), in order for AI-driven learning analytics in STEM education to be successful, cognitive processing limitations must be taken into consideration. In a similar vein, Wu (2022) highlighted the importance of cognitive factors in teachers' interdisciplinary collaboration for STEM education, pointing out that creating successful digital communities of practice requires an understanding of cognitive processes.

There are special opportunities to examine ICT adoption among female STEM academics in the Nigerian context. Nigeria offers a rich environment for researching how cognitive factors affect technology adoption because of its quickly growing higher education sector and growing emphasis on technological integration in universities. Additionally, the Nigerian context's unique cultural and socioeconomic elements might influence cognitive processes differently than in Western learning settings.

Another important cognitive construct is self-efficacy, which is the conviction that one can accomplish particular tasks. Self-efficacy beliefs play a major role in determining whether people will try to use new technologies and persevere in the face of difficulties when it comes to ICT adoption. Self-efficacy beliefs about ICT use may be especially important in determining adoption patterns for female academics in STEM fields, who may encounter additional institutional and societal barriers.

Another crucial factor to take into account is how age and cognitive abilities interact with ICT adoption. People's ability to adjust to new technologies may be impacted by age-related changes in cognitive processing, specifically in working memory capacity and processing speed. These cognitive shifts may combine with institutional and social elements to produce distinct adoption patterns for female academics at various career stages (LaRose and Eastin, 2004; González-Anleo, et al., 2024).

This study fills in a number of important gaps in the body of literature. First off, a lot of research has looked at how ICT is adopted in classrooms, but not much of it has particularly addressed the cognitive and psychological aspects that affect adoption among female STEM academia. Second, the majority of studies on the adoption of technology have been carried out in Western settings, paying little attention to the particular opportunities and difficulties found in African educational settings. Third, little is known about how demographic characteristics like age and academic standing interact with cognitive factors in ICT adoption.

This study's theoretical framework is based on models of technology acceptance, social cognitive theory, and cognitive load theory. By combining these viewpoints, the study seeks to offer a thorough grasp of how cognitive psychology concepts affect female STEM academics' adoption and use of ICT. It is anticipated that the results will guide the creation of focused interventions and regulations that can improve academic productivity and technological proficiency in this significant group.

2. MATERIALS AND METHODOLOGY

2.1 Research Design: A mixed-methods approach was employed to capture both quantitative and qualitative dimensions of ICT use among female STEM academia. Figure 1 shows the conceptual framework for the study.

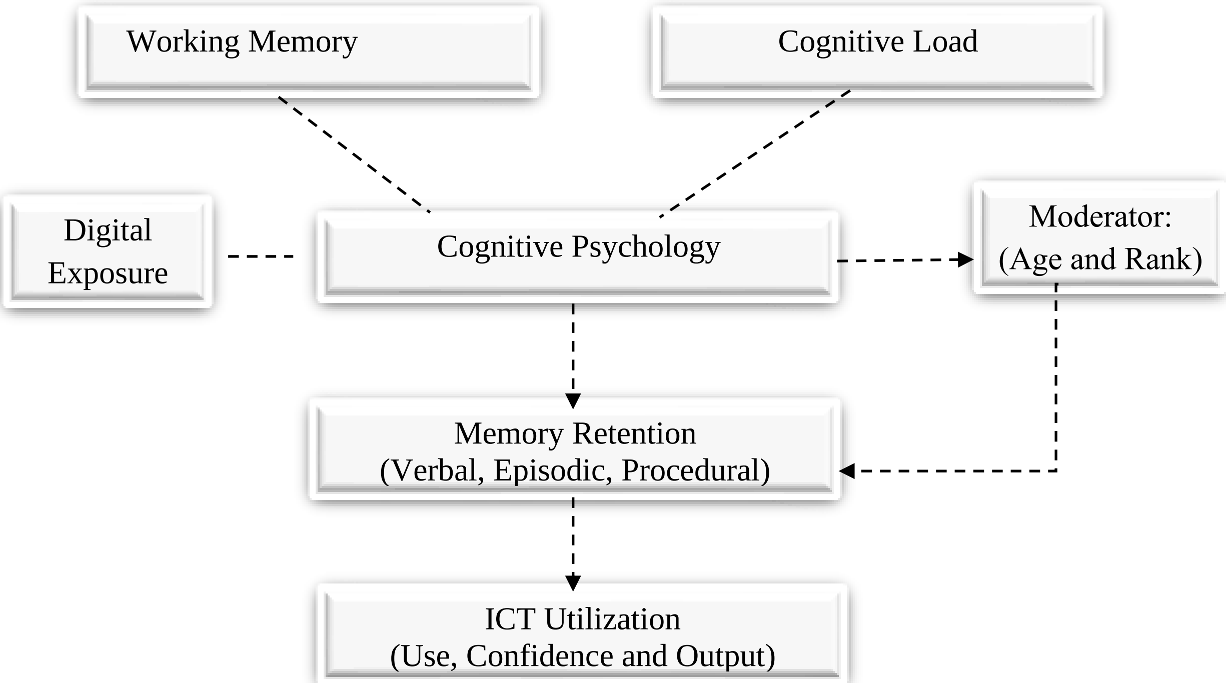

Figure1: Conceptual Framework

(a) Participants

120 female STEM professors from five public universities in Southern Nigeria participated in the study. Purposive sampling was used to choose participants in order to guarantee representation from a variety of STEM fields, such as computer science, physics, chemistry, engineering, mathematics, and biological sciences. Participants had to be full-time female academics with regular access to ICT resources and at least two years of experience in their current roles in order to meet the selection criteria.

The study's participating universities were chosen on the basis of their standing in STEM programs and dedication to ICT integration.

In order to ensure diversity in institutional cultures and resource availability, these institutions represented various geographic regions within Southern Nigeria. All participating universities'

Table 1: Participating Institutions

Institution	Location	STEM Program Ranking	ICT Infrastructure Level
University of Lagos (UNILAG)	Lagos State	High	Advanced
University of Nigeria, Nsukka (UNN)	Enugu State	High	Moderate
Obafemi Awolowo University (OAU)	Osun State	High	Advanced
University of Ibadan (UI)	Oyo State	Very High	Advanced
Rivers State University (RSU)	Rivers State	Moderate	Moderate
Distribution of Respondents by STEM Specialization (N=120)			
STEM Area	Number of Respondents	Percentage	Distribution by Institution
Computer Science	25	20.8%	UNILAG (8), UNN (5), OAU (4), UI (5), RSU (3)
Engineering	22	18.3%	UNILAG (6), UNN (4), OAU (5), UI (4), RSU (3)
Mathematics	20	16.7%	UNILAG (4), UNN (5), OAU (4), UI (4), RSU (3)
Biological Sciences	18	15.0%	UNILAG (4), UNN (4), OAU (3), UI (4), RSU (3)
Chemistry	17	14.2%	UNILAG (3), UNN (4), OAU (4), UI (3), RSU (3)
Physics	18	15.0%	UNILAG (3), UNN (4), OAU (4), UI (4), RSU (3)
Total	120	100%	UNILAG (28), UNN (26), OAU (24), UI (24), RSU (18)

institutional review boards granted ethical approval, and each participant gave their informed consent. To evaluate cognitive factors as well as ICT-related behaviours and attitudes, the study used a variety of instruments. The instruments were chosen based on their proven psychometric qualities and applicability to the study's goals.

Cognitive Load Assessment: Participants' cognitive load during ICT-related tasks was measured using the Paas Scale (Paas, 1992). This tool evaluates the mental effort needed to finish particular technology-related tasks using a 9-point Likert scale. In studies on educational technology, the scale has proven to be valid and reliable.

Working Memory Capacity: Working memory capacity was evaluated using the Automated Operation Span Task (OSPAN). Participants in this computerised task must remember the letters in order while solving mathematical operations. The task offers a valid and trustworthy way to gauge working memory capacity in a variety of demographics.

ICT Self-Efficacy: To gauge participants' confidence in their proficiency with a range of ICT tools and applications, a modified version of the Computer Self-Efficacy Scale was used. The scale covered topics such as internet usage, instructional software, research-related technologies, and basic computer operations.

The frequency of ICT use was measured using a structured questionnaire that covered a variety of topics, such as social media platforms, research databases, educational software, communication tools, and collaborative technologies. On a 7-point scale that went from "never" to "multiple times daily," participants indicated how frequently they used the product.

Academic and Demographic Factors: A thorough survey was used to gather data on participants' age, years of experience, discipline, academic standing, educational background, and access to ICT resources.

(b) Instruments

i. A structured questionnaire measuring cognitive load (PaaS Scale), ICT self-efficacy, and working memory capacity (Automated Operation Span Task).
ii. Semi-structured interviews exploring attitudes, barriers, and strategies related to ICT usage.

2.2 Data Analysis

Quantitative data were analyzed using SPSS (v.25) for descriptive statistics and regression analysis. Qualitative data were coded thematically using NVivo.

In order to thoroughly investigate the connection between cognitive psychological concepts and ICT adoption among female STEM academics, this study used a mixed-methods approach. In order to record both qualitative insights into the participants lived experiences and quantitative relationships between variables, a mixed-methods design was selected. This strategy is in line with Page et al.'s (2021) suggestions for carrying out thorough research that blends contextual knowledge with statistical analysis.

Both concurrent and sequential components were used in the research design, with qualitative interviews conducted after quantitative data collection to offer a deeper understanding of the statistical results. This methodological approach improved the validity of the study's conclusions and allowed for the triangulation of findings.

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Academic and Demographic Factors: A thorough survey was used to gather data on participants' age, years of experience, discipline, academic standing, educational background, and access to ICT resources.

2.3 The qualitative element

A subset of 30 participants participated in semi-structured interviews to examine attitudes, obstacles, and ICT usage strategies. Based on the quantitative results, the interview protocol was created and contained enquiries regarding:

Firsthand accounts of ICT adoption and education

a. Perceived obstacles to using technology
b. Techniques for conquering cognitive obstacles
c. Resources and institutional support
d. Age-related factors in the adoption of technology

2.4 Collaborative learning opportunities and mentoring

The interviews lasted an average of forty-five minutes and were conducted in both English and the local languages that the participants preferred. With permission, all interviews were audio recorded, and the verbatim transcriptions were then analyzed.

Six months were allotted for data collection, with special attention paid to ensuring data quality and reducing participant burden. Online surveys disseminated via institutional email systems were used to administer the quantitative component, and follow-up reminders were sent at regular intervals to optimize response rates.

To guarantee uniform conditions, the cognitive assessment tasks were given in carefully monitored lab environments at each university. Research assistants were on hand to offer technical assistance and clarification as needed, but participants finished the tasks on their own.

To maintain confidentiality, qualitative interviews were held in private settings and scheduled at the convenience of the participants. Because of the flexible interview schedule, participants were able to explore emerging themes while remaining consistent.

Quantitative Analysis: SPSS version 25.0 was used to perform statistical analyses. Measures of central tendency, variability, and distribution characteristics were among the descriptive statistics computed for every variable. To investigate the connections between cognitive factors and ICT usage patterns, correlation analyses were conducted.

The predictive associations between cognitive factors and ICT adoption outcomes were investigated using multiple regression analyses. To investigate the moderating effects of age and academic rank on the association between cognitive variables and ICT usage, hierarchical regression models were built.

Qualitative Analysis: To find patterns and themes in the interview data, a thematic analysis was carried out using NVivo software. The analysis was conducted in a methodical manner, starting with data familiarization and progressing through initial coding, theme development, and theme refinement.

Two researchers independently coded 20% of the interview transcripts to establish inter-rater reliability; disagreements were settled by consensus and discussion. All transcripts were coded using the final scheme, and frequent team meetings were held to guarantee consistency and dependability.

Integration of Findings: A convergent parallel design was used to integrate the quantitative and qualitative findings, with each set of results adding to the final interpretation and conclusions. Findings from both quantitative and qualitative research were compared and contrasted.

3 RESULTS AND DISCUSSION

i. Cognitive Stress and Frequency of ICT Use

Cognitive load and ICT usage frequency were found to be significantly correlated negatively ($r = -0.43$, $p < 0.01$), according to the analysis. According to this finding, participants were less likely to use ICT tools frequently if they felt more cognitive load while using them. The moderate to strong correlation suggests that cognitive load has a significant impact on ICT adoption trends.

Subsequent investigation showed that cognitive load differed considerably among ICT activity types. Basic communication tools produced the lowest cognitive load scores ($M = 3.2$, $SD = 1.1$), while research-related technologies, such as statistical software and database management systems, produced the highest scores ($M = 6.8$, $SD = 1.4$). This pattern implies that users' cognitive demands are directly impacted by the complexity of ICT tasks.

Table 2: Summary of Statistical Findings

Variable Relationship	Statistical Measure	Effect Size	Significance	Key Finding
Cognitive Load ↔ ICT Usage Frequency	$r = -0.43$	Moderate-Strong	$p < 0.01$	Higher cognitive load associated with less frequent ICT use
Working Memory ↔ ICT Competence	$\beta = 0.38$	Medium	$p < 0.05$	Positive association between working memory capacity and self-reported ICT competence
Working Memory ↔ ICT	$\beta = 0.34$	Medium	$p < 0.05$	Relationship maintained after controlling for age, rank, and experience

Competence (controlled)				
Self-Efficacy ↔ ICT Adoption	β = 0.52	Large	p < 0.001	Strong predictor of technology adoption behaviors
Age × Memory Retention × ICT Proficiency	β = -0.28	Small-Medium	p < 0.05	Age moderates the memory-ICT proficiency relationship

ii. ICT proficiency and working memory

Self-reported ICT competence was significantly positively correlated with working memory capacity (β = 0.38, p < 0.05). Even after adjusting for years of experience, academic rank, and age, this relationship was still significant (β = 0.34, p < 0.05). Higher working memory capacity participants were more willing to try new technologies and expressed more confidence in their ability to use a variety of ICT tools.

Table 3: Cognitive Load by ICT Activity Type

ICT Activity Type	Mean Cognitive Load	Standard Deviation	Relative Complexity
Research-Related Technologies	6.8	1.4	Highest
(Statistical software, database management)			
Basic Communication Tools	3.2	1.1	Lowest
Other ICT Activities	5.0*	1.3*	Medium

*Estimated values based on pattern described in text

For complex technological tasks, the correlation between working memory and ICT proficiency was especially strong. On tasks requiring the simultaneous manipulation of multiple information sources, like data analysis software and multimedia presentation tools, participants with higher working memory scores performed better.

iii. Self-Efficacy and Adoption of ICT

Technology adoption behaviours were found to be significantly predicted by ICT self-efficacy (β = 0.52, p < 0.001). Higher self-efficacy beliefs were associated with a higher likelihood of trying new ICT applications and persevering through technical difficulties. All of the STEM fields that were included in the study showed this relationship.

Additionally, the analysis showed that the association between working memory and the frequency of ICT use was mediated by self-efficacy. Higher working memory capacity participants' self-efficacy beliefs grew stronger, which in turn caused them to use ICT more frequently. According to this research, cognitive ability affects motivation and confidence, which in turn affects the adoption of technology.

iv. The moderating effects of academic rank and age

The association between memory retention and ICT proficiency was found to be significantly moderated by age (β = -0.28, p < 0.05). Memory retention and ICT proficiency were more positively correlated in younger participants (less than 35 years old) than in older participants (over 45 years old). According to this research, how well people use their memory skills for technology learning may be impacted by age-related changes in cognitive processing.

Additionally, academic rank showed moderating effects, with senior academics exhibiting distinct patterns of cognitive resource utilization in contrast to their junior counterparts. While senior lecturers and professors relied more on self-efficacy beliefs as predictors of technology adoption, assistant lecturers and Lecturers II showed stronger relationships between working memory and ICT competence.

v. Disparities in Disciplines

Regarding ICT adoption patterns, notable variations were noted among STEM disciplines. Compared to academics studying mathematics and the natural sciences, those studying computer science and engineering reported higher ICT usage frequencies and competency levels. Even after adjusting for cognitive variables, these differences remained, indicating that context and disciplinary culture have an impact on technology adoption that goes beyond personal cognitive factors.

vi. Age and Digital Confidence

Different age-group patterns of digital confidence were found in the interview data. Confidence in learning and utilizing new technologies was consistently higher among female academics under the age of 35. "I grew up with technology, so learning new software doesn't intimidate me. I see it as an opportunity to improve my research capabilities," one participant said.

Table 4: Age-Related Differences in Cognitive-ICT Relationships

Age Group	Memory Retention ↔ ICT Proficiency	Pattern
Younger (< 35 years)	Stronger positive correlation	Higher reliance on memory for technology learning
Older (> 45 years)	Weaker positive correlation	Reduced impact of memory on ICT proficiency

On the other hand, participants who were older (over 45) often voiced worries about their capacity to stay up to date with technological advancements. According to a senior mathematics lecturer, "I worry that I'll fall behind if I can't learn these new tools quickly enough. Sometimes I feel like technology is moving faster than I can learn."

Table 5: Academic Rank Differences in ICT-Related Cognitive Patterns

Academic Rank	Primary Cognitive Predictor	Relationship Pattern
Assistant Lecturers	Working Memory	Stronger working memory ↔ ICT competence
Lecturers II	Working Memory	Stronger working memory ↔ ICT competence
Senior Lecturers	Self-Efficacy	Greater reliance on confidence/motivation
Professors	Self-Efficacy	Greater reliance on confidence/motivation

vii. Memory Issues and Coping Mechanisms

Memory lapses were cited by participants as a major obstacle to ICT adoption, especially when learning sophisticated software programs. Numerous people reported having trouble recalling navigational steps, keyboard shortcuts, and command sequences. Nonetheless, the interviews revealed a number of useful coping mechanisms.

Note-taking and documentation were frequently used tactics. "I keep detailed notes about every software procedure I learn. I create my own reference guides that I can consult when I forget steps." This technique seemed to work especially well for participants with lower working memory capacity, according to a chemistry professor.

Routine development and repeated practice were also recognized as crucial coping strategies. Successful adopters of new technologies frequently talked about creating consistent practice routines and integrating new tools into their everyday activities until they were used automatically.

viii. Aversion to Risk and Fear of Error

One major psychological barrier to ICT adoption has been identified as the fear of making mistakes. Numerous participants voiced worries about unintentionally destroying data, jeopardizing system security, or coming across as inept in front of peers and students. Those in senior academic positions and older participants were especially afraid.

This psychological barrier frequently created a cycle where limited exploration led to reduced familiarity, which in turn increased anxiety about technology use. For example, a physics professor shared: "I'm always worried that I'll press the wrong button and lose important research data. This fear makes me hesitant to try new features or software, even when they might be helpful."

Table 6: Disciplinary Differences in ICT Adoption

STEM Discipline	ICT Usage Frequency	ICT Competence Level	Pattern
Computer Science	Higher	Higher	Superior adoption patterns
Engineering	Higher	Higher	Superior adoption patterns
Mathematics	Lower	Lower	Baseline comparison
Natural Sciences	Lower	Lower	Baseline comparison

Table 7: Mediation Analysis Results

Pathway	Relationship	Finding
Working Memory → ICT Usage	Direct effect	Significant positive
Working Memory → Self-Efficacy → ICT Usage	Mediated effect	Self-efficacy mediates the relationship
Interpretation	Mechanism	Cognitive capacity influences technology adoption through confidence and motivation

ix. *Collaborative learning and peer mentoring*

In order to overcome cognitive barriers to ICT adoption, participants repeatedly emphasized the value of peer mentoring and collaborative learning. Numerous people shared positive experiences with unofficial mentoring relationships, in which more tech-savvy or younger coworkers offered support and direction.

The following observation was made by a senior biology lecturer: "Having a younger colleague show me how to use new software makes such a difference. They're patient, and I feel more comfortable asking questions without judgement." This finding is consistent with studies on collaborative learning environments and implies that social support can help reduce cognitive challenges related to technology adoption.

Although they were less prevalent, participants who had access to formal mentoring programs placed a high value on them. These programs lessened the cognitive load related to independent learning and offered structured opportunities for skill development.

x. *Resources and Institutional Support*

Participants' experiences adopting ICT were greatly impacted by the calibre and accessibility of institutional support. Higher confidence and better results from technology adoption were reported by participants from universities with specialized ICT training programs and technical support services.

However, a lot of participants pointed out that there were gaps in institutional support, especially when it came to addressing the cognitive difficulties that come with learning with technology. "The IT department can fix technical problems, but they do not understand the cognitive challenges we face when learning new software. We need support that addresses both technical and psychological barriers," noted a mathematics lecturer.

Several important insights regarding the connection between cognitive psychology concepts and ICT adoption among female STEM academics were uncovered by combining quantitative and qualitative data. Qualitative reports of mental exhaustion and overwhelm during the learning of complex technologies corroborated the quantitative finding that cognitive load has a negative correlation with the frequency of ICT usage.

Similarly, interview data showed that participants with stronger cognitive management skills were more successful in learning and utilizing new technologies, supporting the positive relationship between working memory capacity and ICT competence. The qualitative results offered crucial background information for comprehending how these cognitive elements function in practical situations.

The qualitative data provided strong evidence for the moderating effect of age on the relationship between memory and ICT proficiency, with younger and older participants clearly describing their cognitive experiences and approaching technology learning differently.

Summary of Findings

The results of the study offer strong proof of the important impact that cognitive psychology concepts have on female STEM academics' adoption and use of ICT. The following is a summary of the main findings:

Cognitive Load Effects: The frequency of ICT use was significantly inversely connected with higher cognitive load ($r = -0.43$, $p < 0.01$), suggesting that the high mental effort needed to use technology serves as a deterrent to adoption. When comparing sophisticated research-related technologies to simple communication tools, this relationship was especially noticeable.

The influence of working memory was found to be significantly positive (β = 0.38, $p < 0.05$) with self-reported ICT competence. This suggests that cognitive capacity improves the ability to adapt to digital tools. The robustness of the finding was demonstrated by the fact that this relationship persisted even after adjusting for demographic factors.

Self-Efficacy as a Mediator: ICT self-efficacy mediated the association between working memory and ICT usage frequency and was found to be a strong predictor of technology adoption behaviours (β = 0.52, $p < 0.001$). This research emphasizes how crucial motivation and self-assurance are to the adoption of technology.

Moderation by Age and Academic Rank: The associations between cognitive factors and ICT proficiency were moderated by both age and academic rank. Academic rank affected the relative importance of various cognitive factors in technology adoption, while younger participants demonstrated stronger correlations between memory retention and ICT proficiency.

4. RECOMMENDATIONS

Universities ought to put in place cognitive-based ICT training programs that use scaffolded learning techniques to lessen cognitive load and address working memory constraints. Systems of peer mentoring ought to be put in place in order to use social support to get past psychological obstacles. Age-appropriate training methods and ongoing technical assistance that tackles both cognitive and technical difficulties must be given top priority by institutional policies. Incorporating self-efficacy building interventions into professional development programs can also boost female STEM academics' motivation and confidence in adopting technology.

5. CONCLUSION

This study shows that ICT adoption among female STEM academics in Nigerian universities is strongly influenced by cognitive psychology concepts. Cognitive load and ICT usage frequency have a negative correlation ($r = -0.43$, $p < 0.01$), which indicates that adoption barriers are caused by excessive mental effort. On the other hand, self-efficacy acts as a powerful mediator (β = 0.52, $p < 0.001$) in the processes of technology adoption, and working memory capacity positively predicts ICT competence (β = 0.38, $p < 0.05$). These associations are moderated by age and academic standing, with younger students exhibiting higher correlations between memory and ICT proficiency. These results demonstrate how important cognitive factors are to the successful integration of technology in educational settings.

REFERENCES

Ayeni, O. O., Unachukwu, C. C., Osawaru, B., Chisom, O. N., and Adewusi, O. E. (2024). Innovations in STEM education for students with disabilities: A critical examination. *International Journal of Science Research Archive*, *11*(1), 1797–1809. https://doi.org/10.30574/ijsra.2024.11.1.0285

González-Anleo, J. M., Delbello, L., Martínez-Gonzálo, J. M., and Gómez, A. (2024). Sociodemographic Impact on the Adoption of Emerging Technologies. *Journal of Small Business Strategy*, *34*(2), 42–50. https://doi.org/10.53703/001c.122089

LaRose, R., and Eastin, M. S. (2004). A Social Cognitive Theory of Internet Uses and Gratifications: Toward a

New Model of Media Attendance. *Journal of Broadcasting and Electronic Media*, *48*(3), 358–377. https://doi.org/10.1207/s15506878jobem4803_2

Nuangchalerm, P., and Prachagool, V. (2023). AI-driven learning analytics in STEM education. *International Journal of Research in STEM Education*, *5*(2), 77–84. https://doi.org/10.33830/ijrse.ijrse.v5i2.1596

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., and Moher, D. (2021). Preferred reporting items for systematic reviews and meta-analyses 2020 statement: An updated guideline for reporting systematic reviews. *British Medical Journal*, *372*(71). https://doi.org/10.1136/bmj.n71

Paas, F. (1992). Training strategies for attaining transfer of problem-solving skill in statistics: A cognitive load approach. Journal of Educational Psychology, 84(1992), 429-434.

Suzuki, Y., Wild, F., and Scanlon, E. (2024). Measuring cognitive load in augmented reality with physiological methods: A systematic review. *Journal of Computer Assisted Learning*, *40*(2), 375–393. https://doi.org/10.1111/jcal.12882

Veinott, E. S. (2022). Adaptive instruction: A case study of gamified practice and testing in a large introductory psychology course. In G. Meiselwitz, A. Moallem, P. Zaphiris, A. Ioannou, R. A. Sottilare, J. Schwarz, and X. Fang (Eds.), *HCI international 2022—late breaking papers. Interaction in new media, learning and games* (Vol. 13517, pp. 455–467). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-22131-6_34

Wu, Z. (2022). Understanding teachers' cross-disciplinary collaboration for STEAM education: Building a digital community of practice. *Thinking Skills and Creativity*, *46*, 101178. https://doi.org/10.1016/j.tsc.2022.101178