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# Professional Learning Communities and Technology Integration Competencies at the Higher Learning Institutions in the Maldives

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## Abstract

This study investigates the effect of Professional Learning Community (PLC) on Technological Pedagogical Content Knowledge (TPACK) in the higher learning institutions in the Maldives, with the moderation effect of gender. A quantitative, cross-sectional research design was employed, with data collected from 300 lecturers at Maldives National University (MNU) and the Islamic University of Maldives (IUM) using a structured questionnaire. PLC was measured using Professional Learning Communities Assessment-Revised (PLCA-R) while TPACK was assessed using the instrument developed by Schmidt et al. (2009). Data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), including moderation analysis.

The findings indicated that, academic staff at the universities demonstrate PLC and TPACK at a higher level. The results also revealed that PLC has a significant direct effect on TPACK, indicating that lecturers who are more linked to PLC practices and settings demonstrate higher levels of technology integration. Gender was also found with a significant but negative influence on TPACK. Furthermore, gender moderates the relationship between PLC and TPACK. These findings highlight the importance of PLC practices over traditional PD practices in enhancing technology integration. The study provides valuable insights for higher education institutions and policymakers in designing PD policies promoting effective digital teaching practices.

## INTRODUCTION AND BACKGROUND

The rapid advancement of Information and Communication Technology (ICT) has fundamentally transformed higher education systems worldwide, reshaping not only how knowledge is delivered but also how teaching and learning are conceptualised (UNESCO, 2015; Bates, 2019). This transformation is particularly significant in small island developing states (SIDS) such as the Maldives, where geography, limited land connectivity, and dispersed populations create unique challenges for educational delivery (UNDP, 2020; Crossley & Sprague, 2014). In such contexts, ICT is not simply an enhancement to traditional instruction but a critical infrastructure for ensuring equitable access to higher education (Daniel, 2016). Within the Maldivian higher education sector, digital technologies have therefore become essential tools for bridging geographical separation across islands, enabling

continuity of learning, and expanding access to diverse learning opportunities (NIE, 2016; Ministry of Education Maldives, 2020). In particular, technology enabled learning has become a generally accepted mean for delivery in HLI besides the challenges experienced by the institutions, academic staff and students.

The Maldives has experienced rapid expansion in its higher education sector over the past two decades, with both public and private institutions contributing to increased access to tertiary education (Lodhia & Spiller, 2021). The Maldivian National Qualifications Framework (MNQF) spans from Level 1 to Level 10, with universities offering certificate, diploma, undergraduate, and postgraduate programmes, including doctoral-level courses. Public universities in particular play a central role in national human capital development by providing advanced academic programmes aligned with labour market needs and national development priorities. In response to the increasing demand for flexible and accessible education, institutions have progressively adopted blended learning and online learning modalities. These shifts have been further accelerated by national digital transformation agendas, including initiatives such as Maldives 2.0, which aim to strengthen ICT infrastructure and promote digital literacy across sectors, including education (Government of Maldives, 2022). The universities have been undertaking important projects in collaboration with international parties in recent years. Examples of major initiatives undertaken by higher learning institutions in the Maldives include the AMED Project and the EduTech Symposium conducted by The Maldives National University, the TEL Project implemented by Islamic University of Maldives, and the DIGIT Asia Project collaboratively carried out by The Maldives National University, Islamic University of Maldives, and Villa College (European Union, 2024; MNU, 2019; Saeed, 2025).

Despite these advancements and efforts, the effectiveness of technology integration in higher education is largely dependent on the competencies of academic staff (Ertmer & Ottenbreit-Leftwich, 2010; Koehler & Mishra, 2009). In the Maldivian context, lecturers are increasingly expected to function not only as content experts but also as facilitators of technology-enhanced learning environments. This is particularly important as the digital native generation of individuals has started to enrol to universities in recent years. This evolving role requires the integration of pedagogical knowledge, disciplinary expertise, and technological proficiency to effectively engage learners in digital and blended learning environments (Mishra & Koehler, 2006). However, evidence suggests that many lecturers still struggle to integrate technology meaningfully into their teaching practices, highlighting a persistent gap between institutional investment in ICT infrastructure and actual pedagogical implementation (Aminath & Waseela, 2022; UNESCO, 2019). According to Adam (2015), technology integration in higher learning institutions (HLIs) in the Maldives remains limited, with lecturers primarily using technology for basic instructional tasks such as presenting PowerPoint slides rather than facilitating interactive and student-centred learning experiences.

One of the most cited frameworks for understanding teachers' ability to integrate technology into teaching is Technological Pedagogical Content Knowledge (TPACK), developed by Mishra and Koehler (2006) and further elaborated by Koehler and Mishra (2009). TPACK conceptualises the intersection of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), emphasising that effective teaching with technology requires an integrated understanding of all three domains. Rather than treating technology as an isolated tool, the TPACK framework positions it as an embedded component of pedagogical decision-making and curriculum design (Koehler & Mishra, 2009; Voogt et al., 2013). In higher education contexts such as the Maldives, TPACK is increasingly relevant as lecturers are required to design and deliver courses across multiple modalities, including face-to-face, blended, and fully online environments.

Although TPACK has been widely studied internationally, its application in the Maldivian higher education context remains sufficiently underexplored. Existing literature suggests that lecturers may possess positive attitudes toward technology but lack the necessary competencies to integrate it effectively into their teaching practice (Adam, 2015; Manik et al., 2014). This disconnect between perceived readiness and actual implementation indicates the need for deeper investigation into the factors that influence TPACK development among academic staff in the public universities. Moreover, given the unique geographical and institutional characteristics of the country, findings from other contexts may not be directly transferable, highlighting the importance of context-specific research (Crossley & Watson, 2003).

Professional development (PD) has been widely recognised as a key mechanism for enhancing lecturers' instructional competencies, including technology integration skills (Desimone, 2009; Guskey, 2002). In the Maldives, PD programmes for higher education academics are conducted frequently; however, their effectiveness in supporting meaningful pedagogical transformation has been questioned. According to Adam (2015), many PD initiatives are characterised as "once-off," "one-size-fits-all," and "sit-and-get" sessions that provide limited opportunities for sustained engagement, collaboration, and contextual application. While such programmes may

raise awareness, they do not sufficiently develop deeper pedagogical competencies required for effective technology integration.

The limitations of traditional professional development models have led to increased interest in more collaborative and sustained approaches to teacher learning. One such approach is the concept of Professional Learning Communities (PLCs), originally conceptualised by Hord (1997). PLCs are defined as structured collaborative environments in which educators engage in continuous reflective dialogue, shared decision-making, collective inquiry, and mutual support to improve teaching and learning outcomes (DuFour, 2004; Stoll et al., 2006). The core dimensions of PLCs include shared and supportive leadership, shared values and vision, collective learning and application, shared personal practice, and supportive conditions (Hord, 1997). These elements work together to foster a culture of collaboration and continuous professional growth within educational institutions. Such practices have been observed among the academic staff in universities in Maldives besides active PLCs are not observed.

In the context of technology integration, PLCs provide a powerful platform for developing teachers' TPACK competencies. Through collaborative inquiry and peer interaction, lecturers can observe how colleagues integrate technology into teaching, exchange strategies, reflect on challenges, and co-develop instructional solutions (Vescio et al., 2008). Such collaborative processes enable experiential learning and professional reflection, which are essential for developing complex pedagogical competencies such as TPACK (Trust et al., 2016). The need for such an environment has been highlighted in the existing literature. Academic institutions need to foster a culture where educators freely consult peers to share teaching resources and acquire new knowledge (Mohamed et al., 2019). Furthermore, PLCs align closely with Social Cognitive Theory, which posits that learning occurs through observation, imitation, and reciprocal interactions between individuals and their environment (Bandura, 1986). Within a PLC, lecturers learn not only from formal training but also from observing peers, engaging in discussions, and receiving feedback, thereby enhancing their self-efficacy in using technology for teaching (Schunk & DiBenedetto, 2020).

In addition to organisational and pedagogical factors, individual characteristics such as gender may also influence technology integration competencies. Previous studies have shown that gender differences may exist in technology usage patterns, confidence levels, and access to ICT-related professional development opportunities (OECD, 2015; UNESCO, 2017). In many contexts, male educators tend to report higher confidence in using digital technologies, although such differences are often shaped by social, cultural, and institutional factors rather than inherent ability (UN Women, 2020). In the Maldivian context, these dynamics may be further influenced by broader gender disparities in ICT education and employment, where fewer women pursue ICT-related fields (UNDP, 2025). As a result, gender may play a moderating role in shaping how lecturers engage with PLCs and develop their TPACK competencies.

Despite growing recognition of the importance of technology integration in higher education, empirical research examining the interplay between PLCs, TPACK, and gender in the Maldivian context remains limited. Most existing studies have focused on general ICT adoption or isolated aspects of professional development, without examining how collaborative learning environments contribute to the development of integrated technological pedagogical competencies. Furthermore, little is known about the levels of PLC engagement and TPACK proficiency among academic staff in public universities in the Maldives. This lack of context-specific evidence presents a significant gap in the literature, particularly given the unique geographical, institutional, and cultural characteristics of the Maldivian higher education system.

This study is therefore grounded in Social Cognitive Theory (Bandura, 1986) and seeks to address these gaps by examining the role of Professional Learning Communities in supporting lecturers' TPACK development. Specifically, the study investigates the direct effect of PLC participation on TPACK among academic staff in public universities in the Maldives, while also examining the moderating effect of gender on this relationship. By focusing on both universities, the study captures the experiences of lecturers operating within a nationally significant sector responsible for delivering higher education across diverse and geographically dispersed communities.

The significance of this study lies in its potential to contribute both theoretically and practically to the field of educational technology and professional development. Theoretically, it extends the application of TPACK and PLC frameworks into a small island developing state context, thereby enriching the global literature with insights from an underrepresented setting. Practically, the findings are expected to inform higher education policymakers, institutional leaders, and professional development designers in the Maldives by highlighting the importance of collaborative, context-sensitive, and gender-sensitive approaches to lecturer development.

*Research Objectives*

1. To examine the level of PLC and TPACK among faculty members.
2. To examine the direct effect of PLC on TPACK among faculty members.
3. To assess the moderating effect of gender on the relationship between PLC nativity and TPACK.
4. To establish the direct effect of gender on TPACK

*Research Questions*

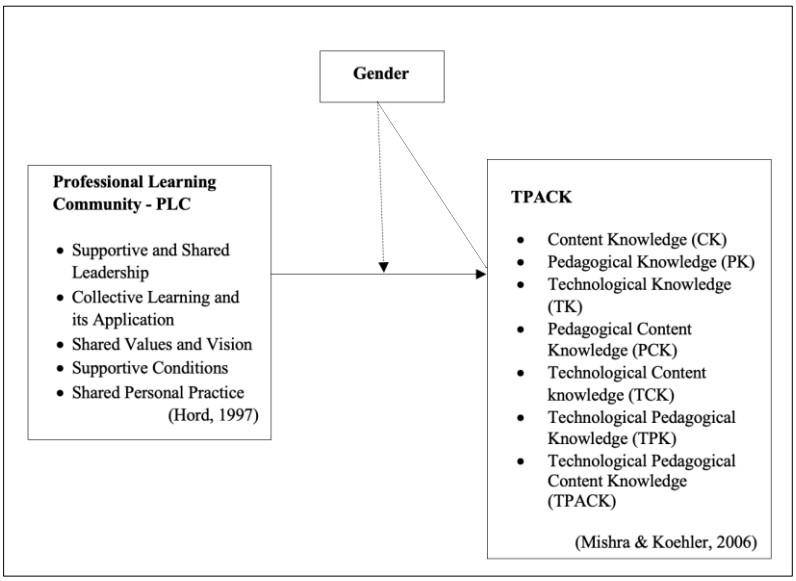
1. To what extent the faculty members exhibit the attributes of PLC and TPACK?
2. Is there a direct effect of PLC on TPACK?
3. Does gender moderate the relationship between PLC and TPACK?
4. Is there a direct effect of gender on TPACK?

*Conceptual Framework*

The conceptual framework of this study illustrates the relationship between PLC and TPACK, with gender acting as a moderating variable. Grounded in SCT (Bandura, 1986), the framework proposes that collaborative professional learning environments positively influence lecturers' ability to integrate technology into teaching and learning practices. In this framework, PLC serves as the independent variable, representing collaborative professional development practices among academic staff, including shared learning, reflective dialogue, collective inquiry, and peer collaboration as proposed by Hord (1997). TPACK is the dependent variable, reflecting lecturers' competencies in integrating technology, pedagogy, and content knowledge effectively in instructional practices.

The framework assumes that participation in PLCs enhances lecturers' professional knowledge and technology integration competencies, thereby improving their TPACK levels. Gender is incorporated as a moderating variable to examine whether the strength or direction of the relationship between PLC and TPACK differs between male and female academic staff. The inclusion of gender is based on previous literature suggesting that demographic characteristics may influence technology-related competencies, professional learning experiences, and attitudes toward ICT integration. Therefore, the framework hypothesises that PLC have a direct positive effect on TPACK, while gender moderates this relationship among academic staff in public universities in the Maldives.

FIGURE 1
CONCEPTUAL FRAMEWORK



## LITERATURE REVIEW

The Professional Learning Community (PLC) framework emerged as a formal concept in the late 1990s to transform school culture from isolated teaching practices into collaborative learning environments. Shirley Hord (1997) conceptualised PLCs as an ongoing strategy for school improvement, building upon earlier organisational learning theories from the 1980s that emphasised shared leadership and collective inquiry. In higher education, PLCs have evolved from basic peer-review circles into structured, cross-disciplinary networks aimed at improving instructional quality (DuFour, 2004; Stoll et al., 2006; Vescio et al., 2008). Meanwhile, the Technological Pedagogical Content Knowledge (TPACK) framework was introduced by Mishra and Koehler (2006) to explain the complex interaction between content, pedagogy, and technology. It built upon Lee Shulman's (1986) foundational 1980s concept of Pedagogical Content Knowledge (PCK) by adding technological knowledge as an essential third domain. Today, TPACK serves as a core framework for evaluating how educators synthesise digital tools with teaching methodologies across global academic settings (Chai et al., 2013; Schmidt et al., 2009; Voogt et al., 2013).

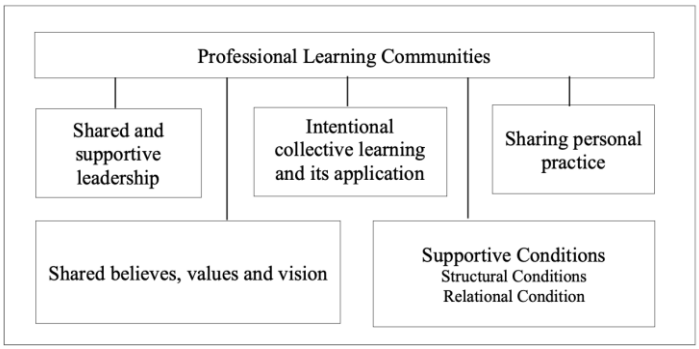
Both PLC and TPACK are highly significant for modern Higher Learning Institutions (HLIs), where complex curriculum demands require continuous academic innovation. Research using these variables has spiked significantly over the last decade, driven by the global shift toward hybrid learning frameworks (Archambault & Barnett, 2010; Bond et al., 2020; Garrison & Kanuka, 2004). In university settings, PLCs provide the institutional support needed to reduce faculty isolation, while TPACK offers a measurable standard for digital literacy among professors (King, 2002; Lawless & Pellegrino, 2007; Schuck et al., 2012). Bibliometric analyses confirm that scholarly publications focusing on university-level PLCs and TPACK integration have grown exponentially across major research databases like Scopus and Web of Science (Scherer et al., 2019; Torrey et al., 2023; Zheng et al., 2021).

Integrating PLCs and TPACK fundamentally shifts academic professional development from one-off workshops to sustained, practice-based learning. PLCs create a secure space where university lecturers can openly share pedagogical challenges and collaboratively design technology-rich lessons (Borko, 2004; Darling-Hammond et al., 2017; Ertmer & Ottenbreit-Leftwich, 2010). This collective environment directly supports TPACK growth by allowing educators to model digital tools and receive immediate peer feedback (Kennedy, 2016; Prenger et al., 2017; Rienties et al., 2013). Consequently, professional development programs that combine collaborative PLC structures with explicit TPACK training result in lasting improvements in teaching quality and student engagement (Garet et al., 2001; Hairon & Tan, 2015; Trust et al., 2016).

The TPACK framework remains a cornerstone for effective technology integration, moving schools away from using digital tools merely for novelty. Rather than treating technology as an isolated skill, TPACK underscores that dynamic learning occurs only when technology, pedagogy, and subject matter align seamlessly (Graham, 2011; Hew & Brush, 2007; Jonassen et al., 2008). Research demonstrates that lecturers with highly developed TPACK can purposely select digital tools that match their specific learning objectives and student needs (Harris et al., 2009; Kim et al., 2013; Kopcha et al., 2016). Ultimately, a strong grasp of TPACK prevents superficial technology use, ensuring that software and hardware actively improve student comprehension and conceptual mastery (Inan & Lowther, 2010; Kirkwood & Price, 2014; Tondeur et al., 2012).

Hord (1997) identified five distinct structural dimensions necessary to sustain a Professional Learning Community: shared and supportive leadership, shared values and vision, collective learning and application, shared personal practice, and supportive structural and relational conditions. These dimensions work together to move an institution away from competitive isolationism toward shared accountability.

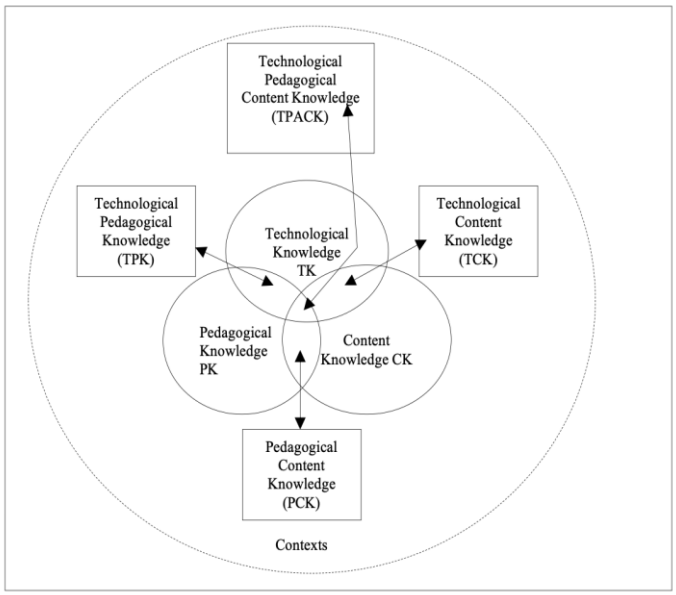
FIGURE 2
PLC MODEL HORD 1997




These structural pillars ensure that faculty development remains continuous, highly collaborative, and institutionalised rather than accidental (Hipp & Huffman, 2010; Hord & Tobia, 2012; Kruse et al., 1995).

The TPACK framework consists of seven interconnected sub-domains arranged inside an overarching contextual circle. The three primary pillars are Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), which intersect to form four distinct combination areas: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and the central core, Technological Pedagogical Content Knowledge (TPACK).

FIGURE 3
TPACK FRAMEWORK




These intersecting dimensions demonstrate that expert teaching requires a deep, fluid understanding of how technologies interact with specific teaching methods and subject topics (Koehler & Mishra, 2009; Mishra & Koehler, 2006; Niess, 2005).

The institutional culture of a higher education institution directly shapes how effectively its faculty develops digital competencies. In Asia, a study at Universiti Sains Malaysia in Penang, Malaysia, found that structured teacher collaboration within university departments significantly improved lecturers' technological pedagogical knowledge (TPK) during online curriculum overhauls (Thah et al., 2021). Similarly, research conducted across public universities in Wuhan, China, at the Central China Normal University, revealed that when academic departments function as active PLCs, peer support mitigates technology anxiety, allowing faculty to adopt advanced digital tools faster (Wang et al., 2023). In Africa, a study at the University of the Witwatersrand in Johannesburg, South Africa, highlighted that collaborative peer circles provided the necessary pedagogical

scaffolding for lecturers to successfully implement learning management systems within resource-constrained environments (Mpungose & Ngubane, 2022).

European and North American studies confirm that collaborative professional environments are key to upgrading technological expertise. In Europe, research at the University of Helsinki in Uusimaa, Finland, demonstrated that participating in inter-disciplinary faculty PLCs helped professors transition from isolated content experts into digitally proficient educators (Lakkala et al., 2021). Meanwhile, in North America, a study at Michigan State University in East Lansing, United States, concluded that the relational trust built within departmental PLCs gave instructors the confidence to test new interactive software in large lecture formats (Koehler et al., 2022). Furthermore, a study at the University of Toronto in Ontario, Canada, showed that sustained peer feedback within faculty learning communities directly advanced participants' overall TPACK scores (Gagnon & Hubert, 2020). South American and Australian research reinforces the global validity of this institutional relationship. In South America, research at the Pontificia Universidad Católica de Chile in Santiago, Chile, established that systematic collaborative planning sessions among STEM faculty led to more mature and effective technology integration in the classroom (Urrutia et al., 2024). In Australia, a study at the University of Melbourne in Victoria, Australia, found that institutional support and shared personal practices within departmental teams significantly boosted lecturers' confidence to design digital assessments (Barbour et al., 2023). Collectively, these international studies show that when higher education institutions invest heavily in building robust PLC structures, faculty TPACK capabilities naturally improve across all academic fields.

Gender differences within TPACK domains continue to present complex, varied results in international literature. In Asia, research at National Taiwan Normal University in Taipei, Taiwan, indicated that male faculty members scored significantly higher in technical knowledge (TK), while female faculty members showed higher scores in pedagogical knowledge (PK) (Lin et al., 2020). Conversely, a study at Kenyatta University in Nairobi, Kenya, found that male instructors expressed higher overall confidence in technology integration, a trend the authors linked to historically male-dominated ICT training programs within the region (Mwangi & Nyaga, 2022). In Europe, a study at the University of Valencia in Valencia, Spain, reported no significant overall gender differences in total TPACK scores, suggesting that equal access to institutional technology resources helps level the playing field for all educators (San Martín et al., 2021).

North and South American studies also highlight how distinct domains can skew along gender lines. Research at The Ohio State University in Columbus, United States, observed that while male faculty members frequently rated their pure technical skills higher, female faculty members scored higher in understanding the interplay between pedagogy and content (PCK) (Cheng & Xie, 2021). In South America, a study at the Universidad de Buenos Aires in Buenos Aires, Argentina, noted that gender gaps in technological confidence vanish when universities run inclusive, structured technology initiatives (García & Bottani, 2023). Lastly, an Oceanian study at the University of Auckland in Auckland, New Zealand, found that gender played a minor role in digital literacy compared to an instructor’s actual years of teaching experience and familiarity with digital platforms (Starkey et al., 2024).

There is currently a shortage of literature exploring whether gender directly moderates the relationship between PLC and TPACK in higher learning institutions. To address this gap, researchers look to related studies on how gender influences professional collaboration and technology adoption. In Asia, a study at Seoul National University in Seoul, South Korea, revealed that female faculty members often benefit more from collaborative networks when building pedagogical skills, suggesting they may get more TPACK value out of a PLC environment than their male peers (Jang & Kim, 2022). In North America, research at the University of Texas at Austin in Texas, United States, showed that institutional support and collaborative structures are more critical for female faculty members when adopting technology, as they often report lower access to informal tech support networks (Ching & Hsu, 2021). Finally, an Australian study at the University of Sydney in New South Wales, Australia, found that while both genders thrive in collaborative settings, female educators rely more on structured PLC systems to build confidence in technical fields (Hubbard & Allen, 2023). This indicates that gender may indeed act as a moderator, altering how much an educator's collaborative workspace translates into individual technological growth.

In summary, the literature demonstrates that Professional Learning Communities (PLCs) and the Technological Pedagogical Content Knowledge (TPACK) framework are essential, interconnected components for advancing modern higher education. When universities foster strong PLC structures characterised by shared leadership, collective inquiry, and collaborative practice, faculty members experience lower technology anxiety and show greater confidence when integrating complex digital tools into their curriculum (Wang et al., 2023; Mpungose & Ngubane, 2022). Concurrently, while global studies confirm that individual TPACK domains often vary along gender lines due to historical training access and technical self-efficacy, equal institutional support consistently works to close these gaps (Lin et al., 2020; San Martín et al., 2021).

Contextual research from the Maldives, highlights that while structured teacher collaboration and virtual PLCs (vPLCs) significantly drive teaching effectiveness, localised structural and environmental realities frequently limit teachers' actual TPACK applications to teacher-centred knowledge transmission (Azlifa & Saeed, 2024; Waseela, 2022). Few existing studies in the local context have explored the factors contributing to TPACK. A recent study conducted in the local HLI context found that digital nativity positively influenced TPACK and gender significantly but negatively influenced TPACK (Imran & Mydin, 2026). Similarly, a study conducted in the Maldives highlighted the contextual factors influencing teachers' pedagogical practices with digital technologies in ESL classrooms in the school context (Mohamed, 2023). Additionally, the same study indicated that technology leadership, digital technology (DT) based professional learning, teachers' knowledge, beliefs, attitudes, existing pedagogical practices, access to DTs and technical support at classroom-level contribute to TPACK. In addition, it is found that early established pedagogical practices contribute to TPACK among school-teachers (Adam, 2015). She further argued that formal PD does not sufficiently help teacher educators to change their pedagogical practices unless it is connected with their backgrounds and the context of practice.

Despite these global and localised insights, a critical gap remains in the literature regarding the exact structural interaction between these variables in higher learning institutions. While separate bodies of research extensively document how PLCs support teacher development and how localised factors restrict actual classroom TPACK deployment (Azlifa & Saeed, 2024; Waseela, 2022), there is a severe shortage of empirical studies exploring whether gender acts as a direct moderator in the relationship between PLC participation and TPACK growth. Specifically, current research fails to explain whether collaborative departmental structures benefit male and female university educators differently. Furthermore, existing studies in Maldives are heavily skewed towards primary and secondary school environments (Azlifa & Saeed, 2024; Nasir, 2024; Waseela, 2022), leaving higher education institutions without clear, data-driven frameworks to optimise collaborative professional development for a diverse faculty. Future empirical research must address this omission by establishing the level of PLC and TPACK among lecturers and the direct effect of PLC on TPACK. Additionally empirical inquiry is at most important on how gender dynamics alter the impact of PLCs on university-level technology integration particularly TPACK.

## METHODOLOGY

*Research Design*

This study adopts a quantitative research methodology coupled with cross-sectional design to evaluate the direct impact of PLC on lecturers' TPACK, whilst exploring whether gender acts as a key moderator. A quantitative strategy is highly appropriate for this research objective because it facilitates the objective measurement of structural relationships and statistical interactions between defined variables (Creswell & Creswell, 2018). By translating abstract institutional behaviours and digital competencies into numerical data, this approach allows to establish objective patterns and produce generalisable findings across the broader higher education sector (Kerlinger & Lee, 2000; Saunders et al., 2019). Furthermore, this approach aligns precisely with the analytical demands of structural equation modelling (SEM), which relies on robust statistical metrics to validate complex predictive paths and moderation hypotheses within a unified framework (Hair et al., 2021; Kline, 2023).

The utilisation of a cross-sectional design is equally justified based on practical and methodological considerations. This design entails gathering empirical data from participants at a single, specific point in time, which makes it a reasonably efficient mechanism for assessing prevailing educational conditions and structural associations without artificially altering the natural academic environment (Creswell, 2014; Tabachnick & Fidell, 2019). Within educational research, cross-sectional strategies are widely respected for their ability to capture a reliable snapshot of institutional cultures, faculty perceptions, and teaching behaviours across a representative sample (Babbie, 2021).

*Population and Sample*

The target population for this investigation comprised lecturers operating within the two public universities in the Maldives including the Maldives National University (MNU) and the Islamic University of Maldives (IUM). These specific institutions were chosen because they serve as the foundational public higher education providers in the nation, hosting a wide array of academic programmes and employing a substantial proportion of the lecturers working at higher education sector. A total sample of 300 lecturers involved in the study, consisting of 154 male and 146 female participants, which yielded a highly balanced representation across genders. To verify that this sample was methodologically robust, the required sample size was calculated using the conventional statistical estimation tables established by Krejcie and Morgan (1970). According to Krejcie and Morgan (1970) sample calculation table, not less than 186 participants are required considering the population of the current study. Utilising this framework ensured that the collected sample was sufficiently large to fulfil the statistical power requirements for quantitative analysis, thereby minimising sampling error and maximizing the overall reliability of the empirical findings.

*Sampling Technique*

To select participants from the target population, this study deployed a stratified convenience sampling strategy. The process began by dividing the overall population into distinct strata according to institutional affiliation, specifically identifying faculty members at the Maldives National University and the Islamic University of Maldives. Utilising stratification was vital to guarantee that both public institutions received proportional and adequate representation within the final sample, thereby strengthening the external validity and generalisability of the conclusions across the wider Maldivian higher education landscape. Following the initial stratification phase, a convenience sampling method was applied within each separate stratum to recruit lecturers based on their immediate availability and voluntary willingness to engage with the research instrument. Although relying on a convenience approach can sometimes restrict absolute external generalisability, blending it with institutional stratification serves as a robust methodological countermeasure that actively minimises sampling bias and balances demographic representation.

*Instrumentation*

The core of the survey architecture focused on operationalising two primary institutional variables including PLC and TPACK. To measure the PLC (independent variable), the study deployed the widely recognised, standardised Professional Learning Communities Assessment-Revised (PLCA-R) instrument developed by Olivier et al. (2009). This psychometric scale maps organisational behaviours across six distinct, interconnected sub-constructs, requiring respondents to evaluate the prevailing dynamics of shared and supportive leadership, shared values and vision, collective learning and its application, shared personal practice, supportive conditions regarding relationships, and supportive conditions relating to structures. Concurrently, lecturers' integrated digital capabilities were evaluated using the comprehensive measurement framework established by Schmidt et al. (2009). This instrument is highly respected for its capacity to analyse and assess educators' professional knowledge fluidly across individual and intersecting technological, pedagogical, and content domains. Finally, to capture essential demographic profiles, a categorical question was embedded within the instrument to record the gender of respondents. For subsequent quantitative analysis and predictive path testing within the statistical software, this demographic trait was numerically converted into binary nominal codes, where male participants were designated as 1 and female participants were designated as 2. The final questionnaire was complied and constructed as a Google Form to be distributed via institutional and departmental Viber groups designated for academic staff of both universities.

*Instrument Reliability*

To ensure the survey questions were accurate and dependable, the study used established scales that have been successfully tested in previous global research. To ensure these questionnaires were appropriate for the local setting, a panel of local experts reviewed the items and made minor adjustments, such as rephrasing certain sentences to better fit the context of Maldivian universities as acknowledged by Saunders et al. (2019). Following these adjustments, a pilot test was conducted with 29 academic staff members to check for any confusing language and to ensure the questions were easy to understand as suggested in Creswell (2018). Data from this pilot test were then analysed using Cronbach's alpha reliability scores for both PLC and TPACK dimensions. In educational research, a score of 0.70 or higher on this test indicates that the survey items are highly reliable and consistent in what they are measuring (Field, 2018). This yardstick has been followed in the current study as well. Cronbach Alpha Reliability Scores for Reliability for PLC and TPACK questionnaire are as follows.

TABLE 1
CRONBACH ALPHA RELIABILITY SCORES FOR RELIABILITY (PLC)

| # | **Dimensions** | **Cronbach Alpha (Based on Original Tool)** | **Cronbach Alpha (Based on Modified Tool)** |
|---|---|---|---|
| 1 | Shared and supportive leadership | .94 | .88 |
| 2 | Shared values and vision | .92 | .85 |
| 3 | Collective learning and its application | .91 | .92 |
| 4 | Shared personal practice | .87 | .92 |
| 5 | Supportive conditions: relationships | .82 | .85 |
| 6 | Supportive conditions: relating to structures | .88 | .92 |

TABLE 2
CRONBACH ALPHA RELIABILITY SCORES FOR RELIABILITY (TPACK)

| # | Dimensions | Cronbach Alpha (Based on Original Tool) | Cronbach Alpha (Based on Modified Tool) |
|---|---|---|---|
| 1 | Content Knowledge (CK) | .85 | .94 |
| 2 | Pedagogical Knowledge (PK) | .84 | .90 |
| 3 | Technological Knowledge (TK) | .82 | .87 |
| 4 | Pedagogical Content Knowledge (PCK) | .85 | .93 |
| 5 | Technological Content Knowledge (TCK) | .80 | .88 |
| 6 | Technological Pedagogical Knowledge (TPK) | .86 | .86 |
| 7 | Technological Pedagogical Content Knowledge (TPACK) | .92 | .89 |

*Data Collection Procedure*

Primary data for this study were gathered using an online survey built and managed through Google Forms, which allowed for an efficient distribution process and quick response tracking. The administrative process was executed through six sequential phases to ensure ethical and methodological transparency. First, the sampling frame was strictly defined as all active academic staff members currently employed in the public universities in the Maldives. Second, formal institutional approvals and ethical clearances were officially secured from the Ministry of Higher Education (MoHE), the Maldives National University (MNU), and the Islamic University of Maldives (IUM) to allow campus-wide research access. Third, specific stratification and inclusion criteria were applied to the sampling frame, filtering eligible participants based on their higher learning institution (HLI) affiliation and their gender to ensure an even demographic balance. Fourth, the required sample size of 300 participants was calculated using standard statistical estimation frameworks to ensure the study maintained adequate statistical power. Fifth, the final distribution of questionnaires was initiated by sharing the web-based survey link through official institutional communication channels, giving staff the freedom to complete the questions at their convenience. Relying on online methods is highly beneficial in university environments because it broadens access across departments and helps achieve higher response rates (Saunders et al., 2019). Finally, data were collected from the conveniently available participants within each stratum who voluntarily chose to complete the instrument. Participation was completely voluntary, and all lecturers were given a clear explanation of the study's purpose before filling out the questionnaire (Creswell & Creswell, 2018). This step-by-step approach ensures that the web-based survey offered flexibility to respondents while producing a highly accurate, reliable dataset for final analysis (Wright, 2005).

*Measurement Model*

Before conducting the primary statistical analyses, the collected dataset was thoroughly screened for missing values, extreme outliers and normality to ensure its suitability for subsequent multivariate testing. Prior to evaluating the core research hypotheses, a comprehensive data verification process was executed, which included a normality assessment, Confirmatory Factor Analysis (CFA), and a model fit evaluation. Additionally, systematic checks were completed to confirm convergent validity, discriminant validity, and overall construct reliability, ensuring that all measurement scales were psychometrically stable and accurate. The statistical outcomes of these screening and validation procedures are summarized in the accompanying table.

TABLE 3
RESULTS OF DATA SCREENING

| # | Test | Measurements | Results |
|---|---|---|---|
| 1 | Normality Test | Skewness & Kurtosis | 98% items' value falls between the range of -2 and +2 |
| 2 | Confirmatory Factor Analysis (CFA) | Outer Loading (Standardised) | 89.5% Acceptable |
| 3 | Model Fit | Chi-square<br>P value<br>ChiSqr/df<br>RMSEA<br>AGFI<br>PGFI<br>SRMR | 22338.79<br>0.00<br>4.60<br>0.11<br>0.31<br>0.32<br>0.07 |
| 4 | Convergent Validity | Factor Loading | 89.5% items acceptable |
| 5 | Discriminant Validity | Heterotrait-monotrait Ratio (HTMT) | PLC 0.142<br>TPACK 0.287 |
| | | Fornell-Larcker | PLC 0.714 > 0.509 (AVE)<br>TPACK 0.765 > 0.585 (AVE) |
| 6 | | Cronbach's alpha, | 0.977 (PLC), |

| | | | |
|---|---|---|---|
| | Construct Reliability and Validity | | 0.981 (TPACK) |
| | | Composite reliability (rho_c) | 0.977 (PLC)<br>0.982 (TPACK) |
| | | Average Variance Extracted (AVE) | 0.509 (PLC)<br>0.585 TPACK |

*Data Analysis*

To analyse the gathered data, Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed, incorporating an assessment of moderating effects. As a variance-based structural equation modelling approach, PLS-SEM is highly effective for exploratory studies, highly intricate model frameworks, and research oriented towards predictive outcomes (Hair et al., 2019; Henseler et al., 2016). This methodology facilitates the concurrent evaluation of several interconnected variables, rendering it highly suitable for exploring the direct and moderated pathways hypothesized in this investigation (Rigdon et al., 2017). Furthermore, the selection of PLS-SEM is justified by its robustness when dealing with restricted sample sizes and data that deviate from normal distributions (Hair et al., 2022). Specifically, moderation analysis was executed to determine how gender might alter the intensity of the connection linking Professional Learning Communities (PLC) and Technological Pedagogical Content Knowledge (TPACK). Statistical significance across all tests was evaluated against a threshold of $p < .05$. Notably, methodological literature strongly advocates for the application of PLS-SEM within social science frameworks that utilize latent constructs and emphasize predictive modelling (Hair et al., 2019; Sarstedt et al., 2022).

*Ethical Considerations*

Ethical protocols were accurately integrated into every stage of the research design, and formal ethical approval was secured from all relevant authorities, including the Ministry of Higher Education (MOHE), the Islamic University of Maldives (IUM), and the Maldives National University (MNU). Individuals involved were fully briefed on the primary research objectives via an informed consent statement embedded directly into the introductory section of the online questionnaire. This digital mechanism ensured that formal consent was secured prior to gathering any data, guaranteeing that contributors fully grasped their entitlements, specifically the freedom to pull out of the study at any stage even without informing. Furthermore, absolute confidentiality and anonymity were rigorously enforced, the collection process strictly avoided any personally identifiable data, and the gathered material was used exclusively for scholarly investigations. Adhering to these ethical mandates remains paramount in pedagogical inquiries to safeguard contributors (American Educational Research Association, 2011; British Educational Research Association, 2018).

## RESULTS

*Research Question 1*

*To what extent do faculty members exhibit the attributes of PLC and TPACK?*

To address the first research question, a descriptive analysis evaluating the mean scores and standard deviations of the dimensions of Professional Learning Communities (PLC) and Technological Pedagogical Content Knowledge (TPACK) was performed. Mean values were interpreted based on standard descriptive thresholds to categorise the overall level of each dimension. The empirical descriptive data are summarised in Table 1.

TABLE 4
LEVEL OF PLC

| Dimension | Mean | Std. Deviation | Level |
|---|---|---|---|
| Shared and Supportive Leadership | 4.03 | 0.44 | High |
| Shared Values and Vision | 4.03 | 0.44 | High |
| Collective Learning and its Application | 4.11 | 0.44 | High |
| Shared Personal Practice | 4.11 | 0.53 | High |
| Supportive Conditions - Relationships | 4.06 | 0.48 | High |
| Supportive Conditions - Structures | 4.09 | 0.44 | High |

TABLE 5
LEVEL OF TPACK

| Dimension | Mean | Std. Deviation | Level |
|---|---|---|---|
| TK (Technological Knowledge) | 4.01 | 0.54 | High |
| PK (Pedagogical Knowledge) | 3.88 | 0.55 | High |
| CK (Content Knowledge) | 3.81 | 0.62 | High |
| TPK (Technological Pedagogical Knowledge) | 4.11 | 0.51 | High |
| PCK (Pedagogical Content Knowledge) | 3.86 | 0.61 | High |
| TCK (Technological Content Knowledge) | 3.97 | 0.68 | High |
| TPACK (Technological Pedagogical Content Knowledge) | 3.74 | 0.71 | High |

The descriptive statistics demonstrate that faculty members consistently exhibit a high level across all dimensions of both PLC and TPACK. Within the PLC framework, Collective Learning and its Application ($M$ = 4.11, $SD$ = 0.44) and Shared Personal Practice ($M$ = 4.11, $SD$ = 0.53) recorded the highest mean scores, followed closely by Supportive Conditions - Structures ($M$ = 4.09, $SD$ = 0.44) and Supportive Conditions - Relationships ($M$ = 4.06, $SD$ = 0.48). The dimensions of Shared and Supportive Leadership and Shared Values and Vision both achieved identical scores ($M$ = 4.03, $SD$ = 0.44).

Regarding the TPACK framework, faculty members scored highest in Technological Pedagogical Knowledge (TPK) ($M$ = 4.11, $SD$ = 0.51) and Technological Knowledge (TK) ($M$ = 4.01, $SD$ = 0.54). The remaining foundational knowledge sub-domains such as TCK ($M$ = 3.97), PK ($M$ = 3.88), and PCK ($M$ = 3.86) are recorded within the high bracket. While the overarching, integrated TPACK construct registered the lowest relative mean score ($M$ = 3.74, $SD$ = 0.71) among the attributes, it still firmly reflects a high level of self-reported competency among the surveyed faculty members.

*Research Question 2*

*Is there a direct effect of PLC on TPACK among faculty members?*
The structural model assessment revealed a positive and statistically significant direct path from PLC to TPACK. The path coefficient ($\beta$) for this relationship is (0.187), indicating that higher levels of participation in a Professional Learning Community lead to increased TPACK scores. This direct effect is highly significant, with an observed $p$-value of ($p < .000$)**,** which comfortably satisfies the required empirical significance threshold ($p < .05$). Therefore, the hypothesis stating that there is a direct effect of PLC on TPACK is statistically supported. Table 3 below summarise this information.

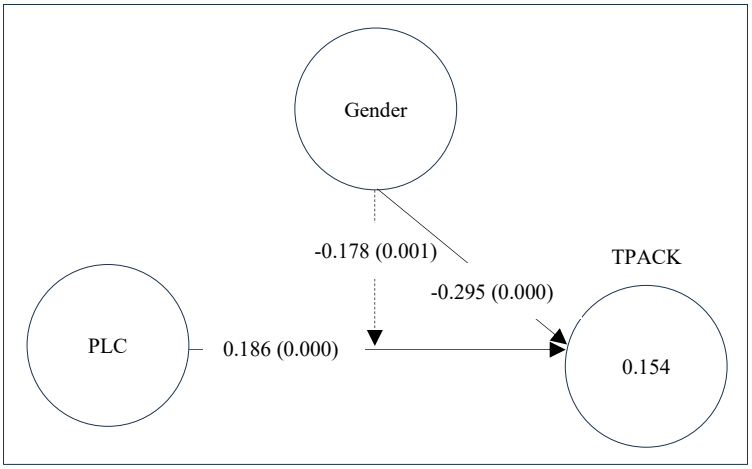
TABLE 6
PATH COEFFICIENTS AND HYPOTHESIS TESTING

| Path and Hypothesis | $\beta$ (Beta) | $p$-values | Result |
|---|---|---|---|
| Gender -> TPACK | -0.295 | 0.000 | Supported |
| Gender x PLC -> TPACK | -0.178 | 0.001 | Supported |
| PLC -> TPACK | 0.187 | 0.000 | Supported |

*Research Question 3*

*Does gender moderate the relationship between PLC and TPACK among faculty members?*
The structural analysis confirmed that gender significantly moderates the relationship connecting PLC to TPACK. The interaction construct (Gender * PLC→TPACK) yielded a negative path coefficient ($\beta$ -0.178)**.** This interaction effect is statistically significant, registering a ( $p$ - 0.001)**,** which falls well below the standard threshold ($p < .05$). As gender has been coded as 1 (for Male) and 2 (for Female), this significant negative path coefficient indicates that the positive effect of PLC on TPACK is statistically stronger for male faculty members than it is for female faculty members. Additionally, the direct control path from Gender to TPACK showed a negative coefficient ($\beta$ = -0.295) that is statistically significant at ($p < .000$). The figure 2 (below) illustrates the structural model for the above-mentioned path coefficients.

FIGURE 4
STRUCTURAL MODEL




*Research Question 4*

*Is there a direct effect of gender on TPACK?*
The empirical results reveal a negative and statistically significant direct effect of gender on TPACK ($\beta$ = -0.295, $p$ < .000). Because the $p$-value falls well below the designated significance threshold ($p$ < .05), the research hypothesis stating that there is a direct effect of gender on TPACK is statistically supported. Given that gender was coded as 1 for male and 2 for female, the negative direction of the path coefficient ($\beta$ = -0.295) indicates that moving from the lower-coded group to the higher-coded group results in a systematic decrease in the outcome variable. Specifically, this demonstrates that female faculty members report significantly lower baseline levels of TPACK compared to their male counterparts within this institutional setting.

## DISCUSSION

*Levels of PLC and TPACK*
The descriptive findings show that academic staff in Maldivian higher learning institutions exhibit high levels across all dimensions of Professional Learning Communities (PLC). Within the PLC framework, Collective Learning and its Application and Shared Personal Practice achieved the highest identical mean scores ($M$ = 4.11). This indicates that university lecturers at the Maldives National University (MNU) and the Islamic University of Maldives (IUM) actively engage in collaborative dialogue. They routinely share pedagogical practices and work together to improve their instructional strategies. Conversely, Shared and Supportive Leadership and Shared Values and Vision recorded the lowest relative scores ($M$ = 4.03). While still high, this variation suggests that administrative decision-making remains somewhat centralised. Top-down management structures can slightly limit the organic expansion of shared institutional governance across departments.

For the Technological Pedagogical Content Knowledge (TPACK) framework, the sub-domains also reflected high self-reported competencies overall. Technological Pedagogical Knowledge (TPK) achieved the highest score ($M$ = 4.11), followed closely by Technological Knowledge (TK) ($M$ = 4.01). This shows that academic staff in universities feel highly confident in using digital tools and implementing technology-supported teaching methodologies. However, the integrated knowledge TPACK construct registered the lowest mean score ($M$ = 3.74). This score drop demonstrates that combining technology, pedagogy, and complex subject matter simultaneously remains challenging, mirroring the initial assertions by Mishra and Koehler (2006) that the central core of TPACK represents a highly sophisticated synthesis. Lecturers feel comfortable with separate tools, but synthesising them within specific disciplines requires deeper, context-situated training rather than superficial workshops, supporting the arguments of Schmidt et al. (2009) and Voogt et al. (2013)

These descriptive patterns align closely with recent research trends in the Maldives. Prior studies by Aminath and Waseela (2022) show that Maldivian teachers display positive perceptions of collaboration and technology integration. However, operational limits often prevent these high perceptions from translating into advanced classroom practices. Local structural realities frequently restrict teachers' applications to superficial, teacher-cantered knowledge transmission, as highlighted by Waseela (2022). The lower score for the integrated TPACK construct mirrors these findings. It confirms that while raw digital literacy is high, true synthesis faces context-specific constraints within Maldivian universities, which Adam (2015) notes cannot be solved by formal professional development unless linked directly to the instructors' background and specific environment.

*Direct Effect of PLC on TPACK*

The structural evaluation revealed a significant, positive direct effect of PLC on TPACK ($\beta = 0.187$, $p < .001$), supporting the conceptual model that collaborative institutional environments foster technological proficiency. This indicates that active participation in departmental PLCs directly improves the digital teaching competencies of university faculty members. When academic departments operate as collaborative learning spaces, peer feedback mitigates technology anxiety, a relationship empirically demonstrated by Wang et al. (2023) in public universities. Lecturers can safely share technical challenges, model software usage, and exchange discipline-specific pedagogical strategies, shifting professional development from one-off workshops to sustained, practice-based instructional growth as suggested by Darling-Hammond et al. (2017) and Borko (2004)

This positive relationship matches international literature regarding faculty development and digital technology deployment. Collaborative peer circles provide critical scaffolding for lecturers to implement technology in diverse educational settings, particularly within resource-constrained environments as highlighted by Mpungose and Ngubane (2022). For instance, structured teacher collaboration significantly improves technological knowledge during curriculum overhauls (Thah et al., 2021). Departmental trust gives instructors the confidence to test interactive tools in large university lecture classrooms (Koehler et al., 2022). Furthermore, sustained peer interaction within faculty learning communities directly advances participants' overall TPACK scores, reinforcing the findings of Gagnon and Hubert (2020) and Lakkala et al. (2021).

Within the Maldivian higher education sector, this finding highlights the essence and value of formal collaborative frameworks. Higher learning institutions in the Maldives face distinct geographical barriers and varying resource allocations across isolated islands as aforementioned. Strong PLC systems allow academic staff at MNU and IUM to pool their digital expertise. This communal knowledge base addresses localised challenges, such as poor technical support, poor ICT infrastructure, or inadequate training (Mohamed, 2023). Consequently, building robust institutional PLCs is an effective mechanism for driving national digital transformation agendas across Maldivian university campuses. This research has established PLC as a contributing factor for TPACK at HLI in the Maldives, while a recent study in the same context concluded that digital nativity as also contributing factor to TPACK (Imran & Mydin, 2026).

*Moderating Effect of Gender*

The structural analysis confirmed that gender significantly moderates the relationship between PLC and TPACK ($\beta = -0.178$, $p = .001$). Because gender was coded as 1 for Male and 2 for Female, the negative coefficient reveals a vital disparity. The positive influence of PLC participation on TPACK growth is statistically stronger for male faculty members than for female faculty members. While collaborative environments benefit all lecturers, male educators derive a higher return in technical knowledge acquisition from these interactions. Furthermore, gender has a significant, negative direct effect on TPACK ($\beta = -0.295$, $p < .001$), showing that female faculty report lower baseline digital competencies overall.

This finding directly corroborates recent empirical evidence collected from Maldivian universities. Imran and Mydin (2026) investigated the academic staff at MNU and IUM, discovering that gender significantly and negatively influences TPACK frameworks. Their research indicated that female lecturers reported lower overall TPACK levels compared to male colleagues. This persistent gap reflects systemic demographic trends in the Maldives. Historically, fewer women pursue advanced studies or professional careers in computer science and technology-related fields, a trend noted in the policy documents of the UNDP (2025). This disparity creates a distinct confidence gap in technological self-efficacy among female academic staff, aligning with meta-analyses by Scherer et al. (2026) who noted distinct male advantages in pure technical domains like TK.

However, the significant moderation effect found here adds a new perspective that contrasts with some international literature. Global studies often suggest that female faculty benefit more from collaborative professional networks when building technical skills, as argued by Ching and Hsu (2021) and Hubbard and Allen (2023). In the Maldivian context, the lower return for female educators suggests that informal departmental dynamics may marginalize women within PLCs. Male instructors may dominate technology leadership roles or informal technical support networks within university departments, similar to the regional ICT barriers noted by Mwangi and Nyaga (2022). Therefore, Maldivian university policymakers must design inclusive, structured PLC initiatives to actively bridge this gap, as recommended by García and Bottani (2023) and San Martín et al. (2021).

*Direct Effect of Gender on TPACK*

The structural model evaluation revealed that gender exerts a significant, negative direct effect on Technological Pedagogical Content Knowledge (TPACK) ($\beta = -0.295$, $p < .000$), demonstrating that female academic staff within Maldivian higher learning institutions in particular the Maldives National University (MNU) and the Islamic

University of Maldives (IUM) report significantly lower baseline digital teaching competencies compared to their male colleagues. This empirical finding directly corroborates contemporary regional data collected by Imran and Mydin (2026), who observed an identical negative gender impact on institutional TPACK frameworks ($\beta$ = -0.298, $p < .000$). This persistent disparity reflects systemic demographic realities and confidence gaps in technological self-efficacy among female faculty members, aligning with global meta-analyses that note a continuing male advantage in pure technological domains despite parity in pedagogical knowledge (Scherer et al., 2026). Consequently, these findings highlight that female educators face unique contextual barriers when synthesising technology with pedagogy, indicating that Maldivian university administrators must move beyond generic IT workshops and implement targeted ICT mentoring initiatives and inclusive professional learning networks to effectively bridge this baseline digital gender divide (García & Bottani, 2023).

**CONCLUSION**

This study establishes a comprehensive understanding of how PLC and gender dynamics influence TPACK within Maldivian higher education. The descriptive evaluation reveals that academic staff across the two Maldivian universities exhibit high levels of readiness and active participation. It has established that the academic staff at universities exhibit the attributes of PLC and has a high TPACK profile in general. As such, the faculty members regularly engage in communal dialogue, share instructional materials, and apply collective learning within their departments. However, smoothly blending technology with specialised content remains a subtle institutional hurdle for many instructors.

The structural evaluation of the framework yields three key findings regarding the relationships between the constructs. Initially, PLC significantly and directly effects TPACK. This demonstrates that, active participation in departmental collaboration directly elevates the digital teaching capabilities of university faculty. When academic environments are structured as safe, collaborative spaces, continuous peer interaction and shared scaffolding allow lecturers to overcome technological anxieties and adopt newer instructional methods more effectively.

Secondly, gender significantly but negatively effects TPACK. The study highlights some form of digital divide based on gender, demonstrating that female faculty members report lower baseline technological pedagogical competencies compared to their male colleagues within these higher learning institutions. Thirdly, gender moderates the relationship between PLC and TPACK. Gender significantly alters how much an instructor benefits from professional collaboration. While peer learning environments support all faculty, male educators derive a considerably stronger return in technological knowledge acquisition from these interactions than female educators do.

Ultimately, these findings show that digital transformation in the Maldivian tertiary sector cannot rely on generic, one-size-fits-all training models or simple infrastructure upgrades. To build a balanced academic ecosystem, university administrators must move towards gender-responsive policies, inclusive collaboration formats, and targeted mentoring networks. Ensuring that female academic staff receive equitable support to build technological confidence driving lasting institutional development across the higher learning institutions in the Maldives.

**REFERENCES**


Adam, A. S. (2015). Professional development for enhancing technology-integrated pedagogical practice: An ethnographic study in a Maldivian teacher education context. *The Maldives National Journal of Research, 3*(1), 7–28.

American Educational Research Association. (2011). Code of ethics. *Educational Researcher, 40*(3), 145–156.

Aminath, W., & Waseela, A. (2022). *Teachers' TPACK and technology integration in teaching and learning: A case study in the Maldives*. Saruna MNU Repository. https://saruna.mnu.edu.mv/items/14ed288a-6983-431e-8110-94a5fd1c842e

Archambault, L. M., & Barnett, J. H. (2010). Revisiting technological pedagogical content knowledge: Exploring the TPACK framework. *Computers & Education, 55*(4), 1656–1662.

Babbie, E. R. (2021). *The practice of social research* (15th ed.). Cengage Learning.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice Hall.

Barbour, M., Jones, R., & Smith, K. (2023). Digital assessment design through collaborative networks in Australian universities. *Australasian Journal of Educational Technology, 39*(2), 45–59.

Bates, T. (2019). *Teaching in a digital age: Guidelines for designing teaching and learning*. Tony Bates Associates Ltd.

Bond, M., Marín, V. I., Lesko, I., & Bedenlier, S. (2020). Mapping higher education technology research: A systematic review. *International Journal of Educational Technology in Higher Education, 17*(1), 1–23.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*(8), 3–15.

British Educational Research Association. (2018). *Ethical guidelines for educational research* (4th ed.).

Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A review of technological pedagogical content knowledge. *Educational Technology & Society, 16*(2), 31–51.

Cheng, S. L., & Xie, K. (2021). Understanding the gender gaps in academic TPACK domains: A North American perspective. *Journal of Computer Assisted Learning, 37*(3), 712–725.

Ching, Y. H., & Hsu, Y. C. (2021). Collaborative tech support networks and gender dynamics in higher education. *Computers in Human Behavior, 118*, 106–119.

Crossley, M., & Sprague, T. (2014). Education in small states: Contexts and issues. *Comparative Education, 50*(4), 455–469.

Crossley, M., & Watson, K. (2003). *Comparative and international research in education*. Routledge Falmer.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage Publications.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.

Daniel, J. (2016). Education for the twenty-first century: Teaching and learning in the global knowledge economy. *Open Learning, 31*(3), 185–197.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.

Desimone, L. M. (2009). Improving impact studies of teachers' professional development. *Educational Researcher, 38*(3), 181–199.

DuFour, R. (2004). What is a "professional learning community"? *Educational Leadership, 61*(8), 6–11.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255–284.

European Union. (2024, November 4). *DIGITAsia project launched*. https://digitasia.eu/news/digitasia-project-launched

Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage Publications.

Gagnon, M., & Hubert, B. (2020). Faculty learning communities and TPACK growth in Canadian higher education. *Canadian Journal of Higher Education, 50*(2), 89–104.

García, M. E., & Bottani, S. (2023). Digital literacy initiatives and gender gaps in Argentinian universities. *Revista Iberoamericana de Educación Superior, 14*(40), 34–49.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915–945.

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education, 7*(2), 95–105.

Garrison, D. R., & Vaughan, N. D. (2008). *Blended learning in higher education*. Jossey-Bass.

Government of Maldives. (2022). *Digital transformation policy initiatives (Maldives 2.0).*

Graham, C. R. (2011). Theoretical foundations for technological pedagogical content knowledge (TPACK). *Computers & Education, 57*(3), 1953–1960.

Graham, C. R. (2013). Emerging practice and research in blended learning. In M. G. Moore (Ed.), *Handbook of distance education* (pp. 333–350). Routledge.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.

Hord, S. M. (1997). *Professional learning communities: Communities of continuous inquiry and improvement*. Southwest Educational Development Laboratory.

Imran, M., & Mydin, A.-A. (2026). Do digital natives teach better with technology? Evidence from TPACK, gender differences, and teaching experience. *International Academic Research Journal of Social Science (IARJ-SS), 12*(2), 1–10.

Kline, R. B. (2023). *Principles and practice of structural equation modeling* (5th ed.). Guilford Press.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60–70.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610.

Lakkala, M., Ilomäki, L., & Kallio, M. (2021). Interdisciplinary faculty PLCs as a driver for university digital transformation. *European Journal of Higher Education, 11*(3), 290–306.

Lin, T. C., Tsai, C. C., & Chai, C. S. (2020). Analyzing gender variations in university faculty TPACK domains. *Asia-Pacific Education Researcher, 29*(4), 311–324.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Mohamed, A., Abdul Razak, A. Z., & Abdullah, Z. (2019). Teacher leadership and teacher professional learning in schools of Maldives. *International Online Journal of Educational Leadership, 2*(2), 36–50. https://doi.org/10.22452/iojel.vol2no2.4

Mohamed, Z. (2023). *Contextual complexities shaping primary teachers' pedagogical practices with digital technologies: An interpretive phenomenological study in the Maldivian ESL context* (Doctoral thesis, The University of Waikato).

OECD. (2015). *Students, computers and learning: Making the connection*. OECD Publishing.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1–6.

Saeed, Z. (2025, January 27). *MNU's EduTech Symposium 2025 set for September*. https://en.mmtv.mv/1881

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson Education.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education, 42*(2), 123–149.

Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology, 60*, 101832.

Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change, 7*(4), 221–258.

Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (7th ed.). Pearson.

Trust, T., Krutka, D. G., & Carpenter, J. P. (2016). Together we learn: The power of professional learning networks. *British Journal of Educational Technology, 47*(1), 15–29.

UNDP. (2020). *Human development report: Maldives country profile*.

UNESCO. (2015). *ICT in education policy and strategy*. UNESCO Publishing.

UNESCO. (2019). *ICT in education in small island developing states*. UNESCO Publishing.

Vescio, V., Bondy, E., & Poekert, P. (2008). Impact of professional learning communities on teaching practice and student learning: A review of research. *Teaching and Teacher Education, 24*(1), 80–91.

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge: A review of the literature. *Journal of Computer Assisted Learning, 29*(2), 109–121.

Wright, K. B. (2005). Researching internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authors, and web-based survey services. *Journal of Computer-Mediated Communication, 10*(3), JCMC1034.